GAS JOURNAL

LIGHT ⁘ HEAT ⁘ POWER ⁘ BYE-PRODUCTS

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VOL. CLXXXVII. No. 3460.] WEDNESDAY, SEPTEMBER 11, 1929. [81ST YEAR.

Editorial Notes.

Suited to the Times.

WHAT we have to do, says Mr. D. Albert Pratt in our correspondence columns to-day, is to make people realize that gas is fashionable—suited to the times. And if by a little faith a "potato crisp" can be made fashionable, surely there is no justification for pessimism on the part of gas suppliers. Gas, for every purpose to which it is applied, can stand by its own unaided merits; but these merits must not only be sincere convictions in the minds of those responsible for gas sales, they must be told to all and sundry. The first line of attack is obviously the lighting load, as we have so often reiterated, not without good reason, in these columns. It is a load which without question has suffered from neglect; and it is manifestly impossible for a sudden spurt of energy immediately to change conditions and ideas which have long prevailed. If, however, effort is both inspired and continued, equally without question the results which will eventually accrue will startle even the optimists. Proof of this bald statement is to be found in the records of those undertakings who during recent years—incidentally suffering (or otherwise) from the incentive of intense competition—have really gone "all out" to retain and advance gas lighting.

To-day the public know very little of fashionable gas lighting; otherwise—to take but one example—visitors to exhibitions would not regard the gas switch as a novelty, or express such ingenuous admiration of the artistic gas lighting fittings which are on display. Frankly, it comes as something of a shock to them that gas and art can live together; and the onus for this rests on past policy in the gas industry. The public cannot be blamed if in every comparison which they make between gas and electricity for lighting purposes, antiquated gas fittings resembling a cross between a battle cruiser and the bowler hat of a music-hall comedian are contrasted with neat and appropriate electrical equipment. The notion of antiquity should be foreign to the mind of the gas consumer and of the public generally. If it is not, the responsibility and the remedy lie with the gas undertakings, because gas lighting appliances both artistic and efficient exist in plenty. These gas appliances, moreover, are essentially fashionable, for they fully meet the demands of the times in respect of health, hygiene, and economy. Purposely we place economy last, for, though we regard it as important, we do not look upon it as being supreme. In the words of Mr. Pratt, people are not all enamoured of the cheapness of the product; if it is shown that gas is fashionable, it is a greater attraction than mere cheapness.

The subject of Mr. Pratt's letter is the suggestive and timely paper which Mr. W. H. Ainsworth gave to the Irish Association of Gas Managers; and our correspondent, though he speaks of lighting as the life-blood of our industry, naturally refers to the other fields of gas service. These too must be kept fashionable. Here, of course, we are on easier ground. By doctors, architects, builders, and the common or garden householder, gas heating is thought of as the last word in hygienic comfort. But it must be remembered that all these people, when considering gas for heating, have in mind modern and appropriate appliances. They do not picture for their rooms the old fantastic ball clay, or the casing which brought joy to none but the fretworker. Why, then, should gas lighting conjure up a vision of the facial expression of the proverbial landlady when her lodger allowed the flickering beams of gaseous radiance to light too long—ah, how long only the lodger could appreciate—the maligned aspidistra in the inevitable bay-window?

Gas in the Streets.

IN the foregoing, we have spoken only of interior gas lighting. Mr. Pratt refers also to the use of gas in the streets, and hands us a bouquet for publishing, in the "JOURNAL" for Aug. 7, a photograph of the magnificent gas lighting of the South Bay at Scarborough. To-day sees the close of a highly successful conference, which began at Bournemouth on Monday last, of the Association of Public Lighting Engineers; and naturally the question of exterior gas lighting came up for discussion. Art and the outside gas lamp was dealt with by Mr. C. H. Woodward, the Public Lighting Superintendent at Bournemouth, in a paper on compromise in the use of illuminants for public lighting; and he did not evince unbounded enthusiasm for the decorative effect of the modern lamp. "The modern efficient lantern," he said, "requires a pre-"heating chamber, an efficient chimney, a large globe, an "elastic suspension, a governor, a controller, and other "gadgets such as mixture controls and by-passes." All this sounds very terrible; but when one comes to consider the matter, the whitewash of alarm is more than streaky. How large are governors, preheating chambers, mixture controls, and by-passes? Is not every switch-controlled interior gas light replete with all these "gadgets," except for the governor? And is not the average consumer unaware of their presence?

However, we are neither tub-thumping nor issuing a questionnaire to our readers. Our only point is that these alarms are minor ones; and we wholly disagree with Mr. Woodward that any decorative scheme which has to be a foster parent to a pressure governor and a controller is foredoomed as such. Also, we do not share the author's opinion that reliance cannot be placed on controllers. "The clock controller for single lamps," said Ex-Bailie James MacDougall, Convener of the Glasgow Watching and Lighting Committee, "has now reached a high state "of efficiency." The main issue in public lighting, as in private lighting, is that gas can stand on its merits; and chief among the merits of gas for outside illumina-

tion is its absence from glare, coupled with its power of dispersion and penetration. Yet, not once in the three papers dealing with public lighting was this virtue of gas so much as mentioned, though the vice of glare itself was treated in most learned manner. "Glare," said Mr. J. S. Dow, the Hon. Secretary of the Illuminating Engineering Society, "must be discouraged;" Mr. Woodward also is of the same opinion. Briefly, the gas industry must really believe and demonstrate that gas is fashionable for lighting. From any conference dealing with public lighting, we always come away with the major impression that local authorities have to consider very carefully every penny they spend on making their roads and streets reasonably safe to pedestrian and motorist. In committee, it appears, they have to be almost apologetic when they suggest that such and such a thoroughfare ought to be better lighted. And gas, it must be borne in mind, is the cheapest illuminant available at the present day for the service rendered.

The fact that we have been aroused to a little criticism of the papers presented to the Association of Public Lighting Engineers this week implies that we have been deeply interested in them. Every contribution, the Presidential Address of Mr. S. B. Langlands, of course, included, was excellent; and we hope to call attention to one or two of the striking points in next week's issue of the "JOURNAL." Meanwhile, let it be put on record that the 1929 meeting of the Association was a splendid stimulus to study of the science and practice of public lighting, and incidentally convincing proof of the utility and potentialities of the Association for communal benefit.

The Coming Session.

WITHIN a very few weeks we shall be once more in the midst of our Association and Circle session, doubtless as strenuous as those that have gone before. Reports of anything from one up to half-a-dozen Association meetings appearing in a single issue of the "JOURNAL" and "GAS SALESMAN," is the prospect which confronts us; and we face it willingly, strong in the faith that these meetings are of inestimable value to those who attend them and (if the proceedings are published) to the industry at large. But though the "spirit" is willing, the "flesh" (in the form of paper, printing, and postage) is sometimes weak; and we find ourselves, in the language of to-day, "up against it." With all the goodwill in the world, it is impossible, within the economic limits which impose themselves, to keep pace at times with the flood of literary effort and oratory. Even apart from economic pressure, we desire as far as possible to have regard to the not inconsiderable proportion of subscribers who complain that they find themselves unable to get through issues of the "JOURNAL" as they appear. We have made appeals for some curtailment in length of papers and addresses, where practicable; but the response has been small. On the threshold of a fresh session, we renew this appeal, and shall await, with chastened feelings, the result.

A remedy for the congestion of our pages with Association and Circle proceedings lies, of course, in our own hands; but it is a remedy which, however it may be regarded by "the other fellow," does not appear to be favourably received by the author himself. We therefore, at this stage, have recourse once more to our appeal. The obvious difficulty in the matter is that no hard-and-fast rules can be laid down; for different subjects demand different treatment. We may say, however, that the matter has once more been brought to mind by the good example set in connection with the proceedings at this week's annual conference in Bournemouth of the Association of Public Lighting Engineers. In the present issue of the "JOURNAL" will be found the Presidential Address and three papers prepared for the occasion (another paper, in the form of a lantern lecture, hardly lends itself to reproduction in our pages); and these occupy an average of no more than four columns apiece —long enough, doubtless, to provide ample food for thought and matter for discussion, and not too lengthy to prevent their reproduction *in extenso* in periodicals which are in duty bound to vary their contents to meet the requirements of many classes of readers. We congratulate the Association, and hope to see many similar examples of self-denial in future.

That is to say, we appeal to authors to help us in a difficulty which grows greater year by year. We feel sure that frequently they can assist us if they will; but if this aid is not forthcoming, then let there be no complaint if, through sheer force of circumstances, the "axe" is applied elsewhere. Though, of course, the award of the Institution medals will have no regard to "JOURNAL" exigencies, we nevertheless look upon this scheme with hopefulness, because conciseness of statement may be expected to be valued as a characteristic.

Gas Consumption, Ltd.

THESE words are an English rendering of an organization in Germany which is actually the equivalent in that country of the British Commercial Gas Association here. One is almost tempted to suggest that "Gas Consumption Unlimited" would be an even better title; for there is no practical end to the road along which well devised propaganda will take us. By now one would have thought that the benefits of such propaganda would be universally recognized; but the small (and diminishing) remnant unassociated with the "B.C.G.A." argues that this inevitable condition of affairs has not yet been altogether reached. We know that the "B.C.G.A." is accepted as a model by other industries in this country; and, judging from an article which we were privileged to publish in last week's issue of the "JOURNAL," no lesser reward need be anticipated for its German counterpart.

The amount of good work which the "B.C.G.A." does with the funds at its disposal is remarkable; and we see that the German organization also is intensely active. Can anyone who studies the activities of the "B.C.G.A." or of the German organization, as set forth in last week's article, entertain a reasonable doubt as to the need for whole-heartedly extending support to the development of gas propaganda, in the way in which support most counts —that is, the financial way? This need has been stressed by us often in the past; and we feel that no excuse should be offered for having given prominence to the excellent results that gas propaganda is achieving in Germany, "in the face of the economically powerful electrical industry, and of the well-organized opposition of the sellers of solid fuels."

Seasonable Appeals.

THE spell of gloriously fine weather which we are enjoying is hardly conducive to the opening of an advertising campaign for the forthcoming gas-fire season, though the fact must be kept in mind that autumn will probably come upon us with a bound. The very thought of cooking just now is unbearable to those who have anything to do with it; and though the evenings are beginning to draw in, it is possible to remain out of doors until so late that domestic lighting hardly calls for consideration. Hot water, of course, is always needed; but even that is doubtless not so popular at the moment as under more normal temperature conditions.

The gas salesman is, however, by no means at the end of his tether. Hot weather affords him the opportunity of making special appeals, just as does the cold. There is no condition under which gas has not its particular uses; and that is a remarkably strong feature in its favour as an industry. It is also a valuable asset from the point of view of the salesman. How readily at the present moment can he secure a sympathetic—nay, even an eager —hearing on the subject of refrigeration, where a small but constant gas load results in infinite satisfaction to the consumer. Then there is another topic of equal, if not greater, importance from the health standpoint, and that is incineration. Flies are troublesome, and one is reminded that it is essential to destroy all garbage that would lead to the multiplication of them. In a back-garden the old-fashioned dust-bin is a horror which many refuse to countenance; in a flat, anything of the kind is

simply out of the question. Here is another seasonable appeal which is assured of a good hearing. There are gas incinerators and coke boilers, installed by the thousand, either of which will consume the whole of the household refuse in the minimum of time and with the minimum of discomfort. What other means can one suggest—in this tropical season, with open fires altogether out of the question—of performing so necessary a duty? Gas is always what it claims to be—one of the greatest friends of mankind.

Dublin Tramway Dispute.

Mention was made in the "JOURNAL" a fortnight ago of the fact that Dublin had been suffering the inconvenience of no tramway service. A dispute over a suggested wage reduction resulted in the men ceasing work about the middle of August, thereby causing much trouble to vast numbers of people who had no personal concern with the matter in dispute. We remarked then upon the wastefulness of the strike as a method of adjusting differences; and we are glad to note that, though somewhat belated, after the trouble had lasted eighteen days, a Court of Inquiry, set up under the Industrial Court Act, 1919, sat to discuss the question. Mr. W. J. Grey, A.C.A., General Manager and Secretary of the Alliance and Dublin Consumers' Gas Company, who acted as an arbitrator in the recent dispute at the Inchicore Works of the Great Southern Railways Company, was engaged in the preparation of the Tramways Company's case for submission to the Court of Inquiry; while Mr. Harold E. Clay, National Secretary of the Passenger Service Group, Amalgamated Transport and General Workers' Union, had in hand the case for the employees.

Changing Conditions.

There will be small disposition to quarrel with the opening sentence of an article in the current issue of the "Westminster Bank Review," that "nothing tends more gravely to perplex the serious observer of contemporary British social life than the paradox of continuous industrial depression on the one hand, and increased popular spending on the other." At one time or another everyone must have been struck by the seeming anomaly of reports of disastrous industrial conditions appearing side by side with accounts of record attendances at all sorts and kinds of sports and amusements. A hasty verdict would probably be one of condemnation for thriftlessness; but this would by no means dispose of the matter. The fact is that we are living in a different world from that of pre-war days. Conditions have changed; and we must all adjust ourselves to the changes. Nothing to-day is to be measured by the standard of twenty years ago; and whatever may be the opinion as to the respective advantages of "ancient" and "modern," there can be no shadow of a doubt that the wage-earning classes have now gone far on a path in which they will not retrace their footsteps. This may mean many things—to the gas industry, as to others. It does not, however, necessarily indicate any drying-up of the channels of fresh business, but rather that it must be sought in new directions. In considering the money that is now spent on pleasure, regard must be had for the fact that wages have increased, and that a portion of the money so spent has in all probability been diverted from less desirable outlets. At all events, the figures published in connection with the Post Office Savings Bank, National Savings Certificates, Building Societies, &c., offer irrefutable evidence of the fact that the small man continues to save money, even if he spends more freely than before.

London's Clearer Atmosphere.

A remarkable panoramic view of London, taken by a staff photographer of "The Times," from the top of the North Tower of the Crystal Palace, during the recent exceptionally fine spell, was published in that paper last Friday, with the statement that its clearness affords proof of the improvement of the atmosphere in London. The picture, which extends across the two pages of "The Times," is certainly a tribute both to the art of the photographer and to the beneficent work of the gas industry, which has done so much for the betterment of the health of the town dweller.

Determination of Carbon Monoxide.

Described by Messrs. F. E. Vandaveer and R. C. Gregg in later columns of our issue to-day is an iodine pentoxide apparatus for the determination of carbon monoxide in flue gases. The method has been developed at the Testing Laboratory of the American Gas Association in co-operation with the U.S. Bureau of Standards; and it is claimed for the apparatus that it retains a high degree of accuracy, is comparatively simple to operate, and permits rapidity of determination. A complete analysis with an accuracy of 0·002 p.ct., it is stated, may usually be made in about twenty minutes; and one chemist can operate two or three instruments and make as many as fifty determinations per day. Discussing the apparatus designed by Dr. Hartley and Mr. Davies, of Radiation, Ltd., and by Messrs. Wood and Howarth, of the Leeds University, the authors state that neither of these systems has provision for removing aldehydes or unsaturated hydrocarbon, except when liquid air is used, and that the employment of a separate iodine pentoxide apparatus for the purification of the gas used for purging tends towards slow manipulation.

OBITUARY.

The death has taken place of Mr. THOMAS C. FULLER at the age of 84 years. He will be remembered by many in the gas industry as Secretary to the Isle of Thanet Gas Company, which supplied gas both to Margate and Ramsgate up to 1877, when the Ramsgate portion of the undertaking was transferred to the Local Authority. Mr. Fuller continued as Secretary of the Company at Margate up to 1914, when he resigned on superannuation after 45 years' loyal and devoted service. The funeral took place at Ramsgate on Sept. 4, when the Isle of Thanet Gas Company was represented by Messrs. Wm. Tomlin, J.P (Deputy. Chairman), Wm. Young (Director), A. J. Stickels (Secretary), A. E. Johnson (Collector), and G. Kennett (District Superintendent). Mr. T. N. Ritson, a former Engineer to the Ramsgate Gas Department, was also present, but Mr. J. M. Campbell, the Engineer to the Isle of Thanet Gas Company, was unfortunately prevented, as he was away on holiday.

FORTHCOMING ENGAGEMENTS.

[*Secretaries of Gas and Kindred Organizations are asked to assist in making this diary of events as complete and useful as possible by sending the earliest intimation of all meetings.*]

Sept. 18.—BRITISH COMMERCIAL GAS ASSOCIATION.—Meeting of the Executive Committee at 11.15, and of the General Committee at 2.30.

Sept. 18.—WALES AND MONMOUTHSHIRE DISTRICT INSTITUTION OF GAS ENGINEERS.—General Meeting at Porthcawl.

Sept. 18-19.—CERAMIC SOCIETY.—Refractory Materials Section Meeting, Midland Grand Hotel, St. Pancras.

Sept. 19.—SOCIETY OF BRITISH GAS INDUSTRIES.—Council meeting in the afternoon.

Oct. 4.—MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.—General meeting.

Oct. 9.—EASTERN COUNTIES GAS MANAGERS' ASSOCIATION.—Autumn meeting in the Holborn Restaurant at 2.30 p.m.

Oct. 28-30.—BRITISH COMMERCIAL GAS ASSOCIATION.—Annual Conference at Eastbourne.

Nov. 20.—SOCIETY OF BRITISH GAS INDUSTRIES.—Autumn General Meeting, Hotel Metropole.

Midlands Salesmen's Circle.—The concluding meeting of the present session will take place on Wednesday, Sept. 18, at 2.45 p.m., in the Chamber of Commerce, New Street, Birmingham, when Mr. H. R. Hems, Hon. Secretary of the Midland District Gas Education Committee, will outline the new regulations for the Gas Education Scheme.

Eastern Counties Gas Managers' Association.—The autumn meeting of the Association will be held under the Presidency of Mr. H. C. Smith, M.Inst.C.E., of Tottenham, at the Holborn Restaurant, on Wednesday, Oct. 9, at 2.30 p.m. A paper will be read by Mr. E. W. Bonsey, of London, on "The Present-Day Position of Small Undertakings from a Distribution Standpoint."

GAS STOCK AND SHARE MARKET.

[For Stock and Share List, see later page.]

MONETARY considerations were again the dominating influence on the Stock Exchange last week, and apart from the interest displayed in the Home Railway Market there is little of consequence to report. The North Eastern were especially prominent, and encouraged by the satisfactory traffic returns a general advance occurred in the other group stocks.

Gilt edged securities closed without any important change, and a fair amount of liquidation was in progress in the Foreign Market, movement in prices being mostly on the downward grade.

The Gas Market was quite active for the time of year, and the feature of the week was a further rise of 20 points in Imperial Continental capital stock to 425-445, business being done at as high as 448 on Thursday last. This quotation compares with 365-385 a month ago—an increase of 60 points. North Middlesex 6 p.ct. consolidated rose 5 points to 110-115, and small increases in price were also recorded in European £10 shares and Southampton 5 p.ct. maximum. Transactions were recorded in Commercial ordinary at 95, which, on the last annual dividend, makes the stock a very attractive purchase.

The following transactions were recorded during the week:

MONDAY.—British 5 p.ct. debenture 96½, European 16¼, 16$\frac{5}{16}$, 16$\frac{3}{8}$, 16$\frac{3}{4}$, 17, £17 1s., 17$\frac{1}{16}$, 17$\frac{1}{8}$, Gas Light and Coke 18s. 3d., 18s. 4½d., 18s. 6d., 3½ p.ct. maximum 61$\frac{3}{4}$, 4 p.ct. preference 74½, 5 p.ct. debenture 99½, Imperial Continental 420, 422, 425, 428, 432, 433, 435, 436, 437, 438, 440, 441, 442, 443, 443½, 445, 446, 447, 448, 449, 450, 452, 452½, 454, 455, Primitiva 35s. 9d., 36s., South Metropolitan 101½, 101$\frac{5}{8}$, 102¼, 6 p.ct. preference 106½, Southampton 5 p.ct. 76½, 77½. Supplementary prices, Associated "A" $67, Liverpool 5 p.ct. 93½.

TUESDAY.—Bombay 18s. 6d., Commercial 94½, 94¾, European 16$\frac{3}{4}$, 17¼, Gas Light and Coke 18s. 1½d., 18s. 3d., 18s. 4½d., 18s. 5¼d., 18s. 6d., 3½ p.ct. maximum 61½, 5 p.ct. debenture 99½, Imperial Continental 425, 429, 430, 432, 433, 434½, 435, 436, 438, Primitiva 35s. 6d., South Metropolitan 100$\frac{3}{4}$, 101$\frac{1}{8}$, 102, 3 p.ct. debenture 58, South Suburban 5 p.ct. 104. Supplementary prices, Brighton and Hove 7 p.ct. debenture, 1930 102, 7 p.ct. debenture, 1935 102, British, Norwich 3 p.ct. debentures 52.

WEDNESDAY.—Alliance and Dublin 96½, Barnet 7 p.ct. maximum 112½, 113½, Bournemouth 6 p.ct. preference 10$\frac{3}{4}$, Brighton and Hove 6 p.ct. 113½, 114½, 115, 5 p.ct, 101½, 101$\frac{3}{4}$, 102½, Commercial 95, Croydon sliding scale 109, European 17, 17¼, 17$\frac{3}{8}$, Gas Light and Coke 18s., 18s. 0$\frac{3}{4}$d., 18s. 1½d., 18s. 2¼d., 18s. 3d., 18s. 4½d., 18s. 6d., 4 p.ct. preference 73½, 5 p.ct. debenture 98$\frac{3}{4}$, Imperial Continental 428, 429, 430, 431, 432, 433, 435, 436, 438, 439, 440, 442, 443, South Metropolitan 101¼, 6 p.ct. preference 106½, South Suburban 5 p.ct. debenture 95. Supplementary prices, Associated "A" 68\frac{1}{8}$, 68¼, British, Norwich 3 p.ct. debentures 52, 52½, Cromer 5 p.ct. 78½, Liverpool 5 p.ct. 94$\frac{1}{8}$.

THURSDAY.—Alliance and Dublin 96½, Bournemouth "B" 12½, 12$\frac{5}{8}$, Bristol 5 p.ct. 88½, Cape Town 10, 10$\frac{1}{16}$, European 17$\frac{1}{8}$, 17¼, Gas Light and Coke 18s. 1½d., 18s. 3d., 18s. 4½d., 4 p.ct. preference 73$\frac{3}{4}$, 3 p.ct. debenture 57½, Imperial Continental 435, 437, 438, 439, 440, 442, 443, 444, 445, 446, 447, 448, 3½ p.ct. debenture 70, Liverpool 7 p.ct. preference 100½, Swansea 7 p.ct. preference 100½, Tottenham 3½ p.ct. 106. Supplementary prices, Associated "A" 71\frac{3}{4}$, Brighton and Hove 7 p.ct. debenture 102½, Hartlepool 5 p.ct. maximum 82, Liverpool 5 p.ct. 93, 93$\frac{3}{8}$, Tonbridge new "E" 179, 179½.

FRIDAY.—Alliance and Dublin 97½, European 16¾, 17, Gas Light and Coke 18s., 18s. 3d., 18s. 4½d., 3 p.ct. debenture 57½, Imperial Continental 437, 438, 440, 442, 443, 444, 445, Newcastle 3½ p.ct. 16s. 10½d., South Metropolitan 101$\frac{3}{4}$, 102. Supplementary prices, Associated Gas and Electric "A" $72, Croydon 7½ p.ct. preference 103, 103½.

There was a plethora of funds in Lombard Street, and, after borrowers had paid 4 p.ct. for fresh accommodation, balances were offered freely at 3 p.ct.; old day-to-day loans being renewed at the former percentage. The full amount of Treasury Bills was allotted, the average rate being £5 9s. 8·19d. p.ct., or 0·68d. p.ct. below the previous week's rate.

On the Foreign Exchange Market the movements were within narrow limits and mostly in favour of this country. Sterling on New York closed at 4.84$\frac{7}{16}$; French francs at 123.89; Italian lire at 92.70½; and Spanish pesetas at 32.90½. German reichsmarks appreciated slightly to 20.36½ and Belgas to 34.88$\frac{3}{4}$; Dutch florins, at 12.09$\frac{3}{4}$, were unchanged.

Silver was in an uncertain state, and the quotation, after declining, rose to 24d. per oz., while Gold remained at the nominal price of 84s. 11½d. per oz.

The Bank Rate is 5½ p.ct. to which it was raised from 4½ p.ct. on Feb. 7. The Banks' deposit rate is 3½ p.ct., and the deposit rates of the Discount Houses are 3½ p.ct. at call and 3$\frac{3}{4}$ p.ct. at notice.

SECOND WORLD POWER CONFERENCE.

Particulars to hand from Germany show that preparations are already well in hand for the Second World Power Conference, which is to be held in Berlin during June, 1930. The generation of power by water and fuels was the principal subject considered at the Sectional Conferences in Bâle, London, Barcelona, and Tokyo. The most prominent matters to be dealt with at the forthcoming Second Plenary Conference in Berlin will be the distribution and utilization of power.

It is pointed out that the Fuel Conference held in London in September and October, 1928, gave, for the first time, a complete survey of the development of the fuel industries throughout the world from those industries producing raw materials to those concerned with refining. Never before has this subject, in all its details and in its general influence, been brought home to such a wide circle of engineers, financiers, and State authorities. The latest achievements in the preparation, distillation, carbonization, and combustion of coal and peat, in the cracking and refining of oils, and in the production of gas, were dealt with by the leading fuel experts of the world. The consumer of fuel obtained valuable suggestions from the numerous papers dealing with fuel economy—in the new combined low-temperature distillation and power plants, in large and small industrial plants, for domestic purposes, and in transport. The political economist, the industrialist, and the statesman were all interested in the papers and discussions on the trend of oil prices, gas supply, and coal refining. The influence of these papers on governmental and private economic organizations has been apparent.

The 1930 Conference will treat of this complex of problems with special reference to the distribution of fuels among their various possible uses. Questions which will be dealt with include the coal mining industry as a basis for national gas supply, the close connection between gas and its bye-products both as regards production and disposal, particularly in respect of coke, and the influence of turnover on the price level of gas and coke, and on the cost of producing gas. Discussions on the important technical and economic questions affecting the distribution of gas, especially over long distances, will prove of great interest.

Particulars regarding the aims and activities of the conference are to be found in an official booklet issued from the Zweiten Weltkraftkonferenz, Berlin N.W. 7, Ingenieurhaus.

"From Gas Storage to Prison."

In the "JOURNAL" for April 18, 1928, p. 187, there appeared an illustration and a brief article under the heading of "From Gas Storage to Prison." It was stated then that the picture reproduced had been received from a news agency, who said that it illustrated a disused gasholder in Berlin, which had been converted into a prison. We have now received a letter from the Publicity Department of the Berlin Municipal Gas-Works, pointing out that, so far from having been converted into a prison, the gasholder shown is still serving its original purpose.

Department of Scientific and Industrial Research.

Under the Order in Council dated Feb. 6, 1928, the Lord President of the Council has appointed the Rt. Hon. Lord Rayleigh, D.Sc., F.R.S., Sir Arthur Balfour, K.B.E., Sir William H. Bragg, K.B.E., D.Sc., F.R.S., and Sir James Walker, D.Sc., Ph.D., LL.D., F.R.S., to be members of the Advisory Council to the Committee of the Privy Council for Scientific and Industrial Research. The following members of the Advisory Council have retired on completion of their term of office: Sir H. C. Harold Carpenter, F.R.S., Dr. G. C. Clayton, C.B.E., Sir Richard T. Glazebrook, K.C.B., F.R.S., and Sir James H. Jeans, D.Sc., LL.D., Sec.R.S.

Wales and Monmouthshire District Institution of Gas Engineers and Managers.—A meeting of the Institution will be held in the Council Chamber, Porthcawl, on Sept. 18, at 11 a.m., under the Presidency of Mr. Frank Boardman, of Cardiff. Mr. G. E. Childs, of Ferndale, will read a paper entitled "Notes on Road Tars."

ASSOCIATION OF PUBLIC LIGHTING ENGINEERS.

Bournemouth Conference—Sept. 9, 10, 11, 1929.

[A report of the Proceedings will appear in next week's "Journal."]

ADDRESS OF THE PRESIDENT, MR. S. B. LANGLANDS, J.P.

I am presiding over your meeting through the passing of two splendid colleagues, Mr. Dickenson, of Liverpool, and Mr. Wright, of Bournemouth.

Mr. Dickenson contributed a paper a year or two ago on "Public Lighting," to which many of us refer when carrying out electrical installations. Mr. Wright, a man with a retiring disposition, was one of those with whom it was useful to discuss intimate details of our day-to-day practice. One of the greatest values of our annual meetings is to enable us to meet and know such men.

I would, in a word, thank you for the trust you have shown towards me in asking me to step into the breach in our ranks. We have as yet no Council's Report—a defect which will be remedied before our next meeting. Let me, therefore, give you a few notes and figures on the growth from strength to strength of our Association.

Some Facts and Figures.

We are now about six years old, and have the support of four honorary, one hundred-and-four ordinary, and thirty-five junior members, and of twenty-six associates, and the delegates at our annual meetings of corporation members for the various cities. We are a corporate body with growing funds. Our balance in hand in money is possibly thought to be small, but the initial formation expenses of our Association were naturally somewhat heavy. In the years to come we shall have more monies to carry out the true work of the Association.

I think we can justly be proud of our initial years. We have enjoyed recognition of our work by kindred associations and by the Public Authorities controlling public lighting throughout the country, and we have received this recognition because we have truly accomplished real work. Our representatives on the British Engineering Standard Association Specification Committee on Street Lighting were assiduous in their efforts to keep practice and theory as partners, not rivals, as they too often are. Again, our representatives on the International Commission on Illumination expressed our Association's views and outlook to our complete satisfaction, and with great credit to themselves; the splendid spirit of give and take for the advancement of the science of street lighting was due in no small measure to their wise attitude towards the views of others.

At this point I would like to remind you of the visit of the "I.I.C." to Britain in September, 1931, and to ask one and all to do everything in their power to make these meetings a credit to the good name of our country. Let us be worthy of the great British name we carry. Last year our American cousins showed us what organization with a true desire towards hospitality can do towards success; their arrangements were conceived in so thoughtful and complete a way as to leave us almost despairing. Let us put the same whole-hearted kindliness in our efforts, and trust to win through with credit and a further strengthening of the bond of international amity. We can certainly show those visitors our lighting outlook, which is in many cases so essentially different from theirs; our staid conception of our lighting duty to each and all of a town's or city's inhabitants as contrasted with their sometimes excessive lighting of show streets and meagre lighting of by-ways; and our technical intercourse should be extremely valuable because of this disparity of outlook.

Street Lighting Ideals.

These remarks create the query as to what we each and all are doing and intend doing What are our street lighting ideals? Is the Standard Specification our entire answer? Well, it is certainly enough to be going on with for improving the streets at night in our various towns, but many other things will be needed by each city lighting engineer if progress is to be made. I cannot conceive of any public lighting department not having a well-equipped testing section if not a complete research laboratory. I can assert confidently that the Glasgow Lighting Department Laboratory has been invaluable to us, and has saved and is saving money continuously. Instead of empirical hit-and-miss methods, we predetermine the value of all materials to be used—burners, mantles, bulbs, lanterns, cables, &c. We bring in materials after they have been in use and determine deteriorations, and try to solve problems arising in our routine work—of physical change of condition of plant. I regret that it was found impossible to include a paper on "Laboratory Practice" in this year's programme, but I am hopeful that such a paper will be available next year. We are experimenting just now with electrical relays, as I can foresee the time when the lighting and extinguishing of a city's lamps will be done from one or two divisional stations, and these stations will be more like the engine room of a ship than a muster hall for lamplighters.

We have chosen one big housing area for initial experiment, and intend to build the station this season.

Cable and Main Laying.

Another idea, and I am giving it in its crudity, is the method of laying supply cables for our work. Accessibility and safety are my claims for this method, and though one of my electrical engineering friends has damned it and me, not with faint praise, but with dissuaders almost as sure as

THE PRESIDENT.

S. B. Langlands, of Glasgow.

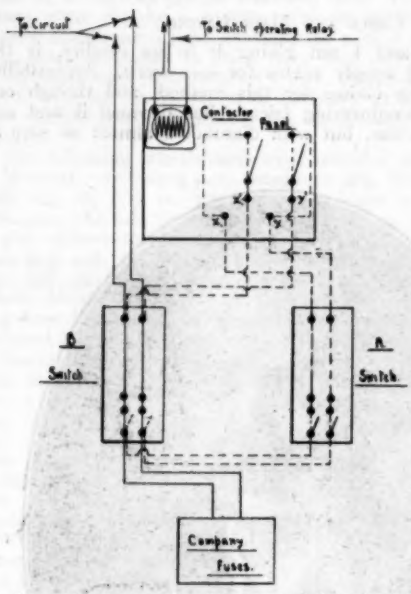
Mr. Langlands was trained under Mr. James McGilchrist, of Dumbarton, from 1886 to 1896. He was in Coleraine as Gas and Water Engineer from 1896 till 1904, when he went to Glasgow to take charge of the distribution of the Glasgow Corporation Gas Department. In 1906 he was appointed Public Lighting Engineer for Glasgow, and he is also Statutory Inspector of Gas Meters. For considerably over thirty years, Mr. Langlands has been a member of the Institution of Gas Engineers. He is a Past-President of the Irish Association of Gas Managers, and an ex-Chairman of the Glasgow Section of the Society of Chemical Industry.

bell, book, and candle, I want it tried. Our city streets are a burying ground that is getting over-crowded, and you cannot keep trouble underground by concrete roads or concrete founds for bitumen-surfaced roads.

I know the many objections that will be urged: The difficulty of insulation and therefore danger, the possibility of excessive dampness, junction difficulties at street intersections. But all these and other hurdles can be surmounted. The street engineer may object to his kerb being used; then, attach my idea on to and behind the kerb. Nothing was ever yet suggested, if it was worth trying, which did not, by its own inherent merits, overcome its own created difficulties. It may be that the whole matter of the ventilation of the soils beneath city streets will ultimately have to be tackled, and that lighting department pillars, when of sufficient heights, will be used as ventilating shafts with extractors at

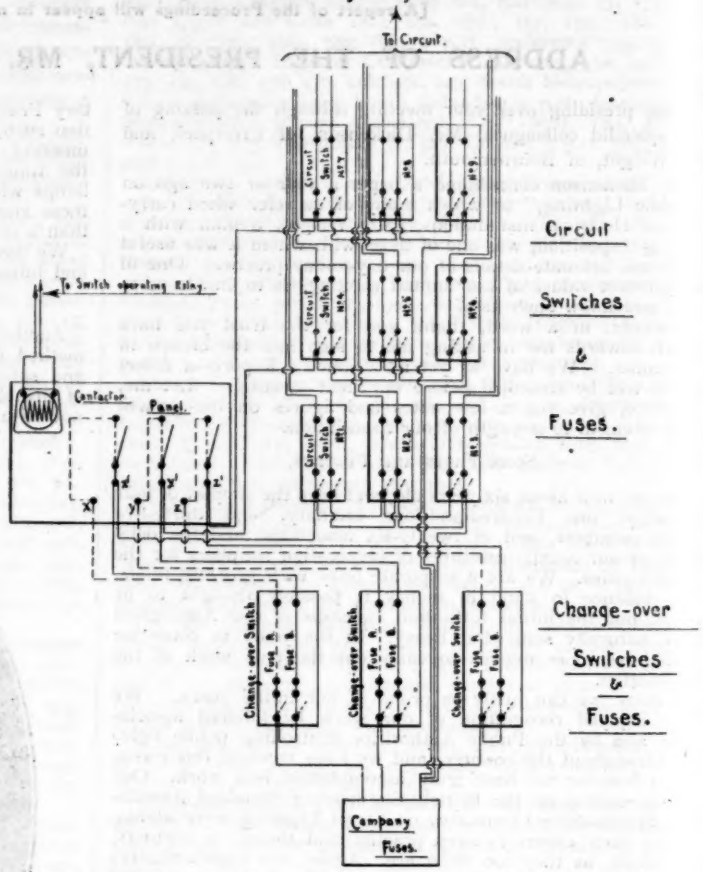
RELAY CONTROL of STREET LIGHTING IN GLASGOW.

Single Phase Panel for Relay or Hand Control of Large Lighting Units.



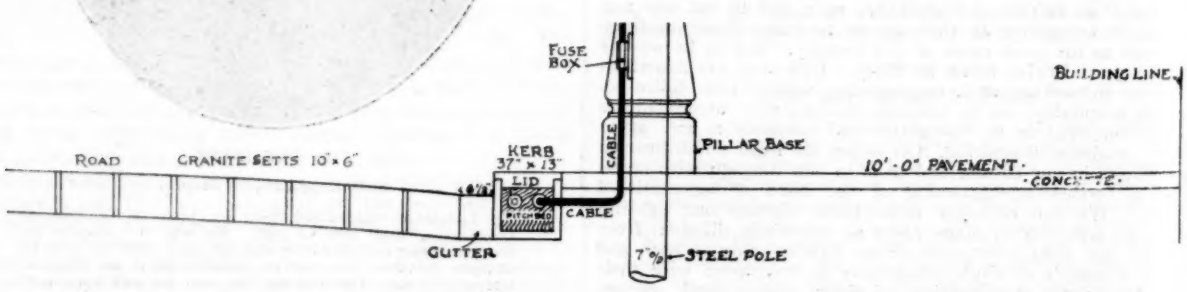
Circuits shown completed for Hand Lighting (Full Lines). For Relay Lighting, transfer fuses from B to A switch and close A switch (Dotted Lines).

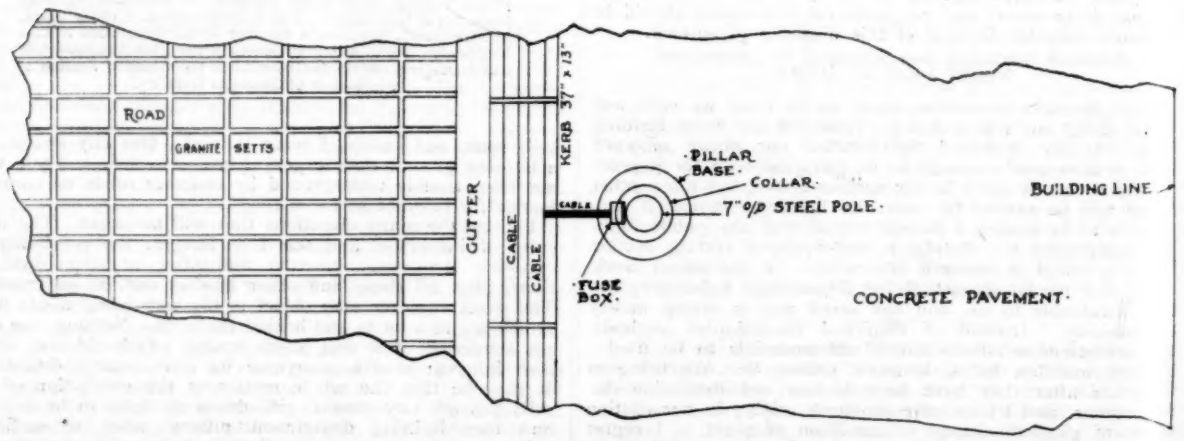
Three Phase. Panel for Relay or Hand Control of Small Lighting Units.



Circuits shown completed for Hand Lighting (Full Lines). For Relay Lighting, transfer fuse from B to A position in change-over switches (Dotted Lines).

LIGHTING AND EXTINGUISHING ARRANGEMENTS.





ACCESSIBILITY AND SAFETY IN MAIN AND CABLE LAYING.

the top. I speak of this to cause public lighting engineers to look ahead and be ready to meet many claims that will be made upon them beyond mere lighting.

TARIFFS.

The question of tariffs for gas and electricity could well form a topic for a vigorous discussion at our meetings. The prices we are charged varies so greatly in each city and town.

I notice our electrical friends have set up a Tariffs Committee. Might I modestly suggest that the prices charged for public lighting have their early attention, and also that a standardization of the charge for places having 100,000 of a population at a price below 1d. per unit should seriously be considered. Most of our current consumption is taken during quiet hours, and we are possibly the most regular and consistent consumer they have got. It might be worth our while to set up a small Committee to watch our interests in this matter.

IMPORTANCE OF MAINTENANCE.

There is one appeal I want to make to those in charge of public lighting. Give maintenance of plant first place in your every-day thoughts. Nothing is more distressing than the sight of a good installation neglected and losing efficiency for lack of that little touch each day that keeps plant at "concert pitch." Do not exact too much from your material, rather be satisfied with 1000 effective hours than 1500 eventually defective hours. Our work fills the eye of every man, so fill it pleasingly.

At odd times we get submitted something novel and possibly epoch making. Should we not have a Committee to test and assess the value of new ideas, the convener of that Committee to distribute around those cities having well-equipped testing stations any gear discovered, and the results of the tests to be ultimately the property of all our members? None need be afraid of the testing station if the articles submitted have intrinsic worth, and this brings me to my final words—words in which I would commend to your attention the exhibition which is being held in the adjacent hall. The firms have taken a lot of trouble, and there are many splendid pieces of apparatus applicable to our work.

I would ask you, for instance, to examine carefully the exhibits which take advantage of the physical behaviour of selenium. This metal reacts according to the amount of light it receives—much as we do. It is an emotional substance, and its present application takes advantage of this attribute. There are interesting possibilities here—a problem for my suggested Research Committee.

It is a matter of regret that in the Royal Commission's first report on "The Control of Traffic on Roads," no pronouncement was made on the need for complete reflective lighting of thoroughfares. When enactments emerge as a result of the labours of this Royal Commission our Association will require to watch carefully their provisions, and it might be well if a small sub-committee, (say) three members of the Council, were appointed now for this purpose.

DUTIES INCREASING DAILY.

The duties of a city's lighting engineer are increasing daily. The care and maintenance of police signals, and of traffic signs and controls, the care and maintenance of city clocks are already part of our duties in Glasgow, working in conjunction, of course, with other chief officials, and if the proposal to illuminate street name tablets and street numbers receives any support, then the number of lighting points to be maintained will be greatly increased.

You may be asked to plot out lighting schemes for new public buildings, and we accept all these tasks willingly, knowing the value of the experience. Our work has, of necessity, to be done in conjunction with the work of other public departments, and we must try to get them to realize that they can assist us in many ways. We can discuss reflective values of road surfaces with city engineers, the visibility of policemen as a lighting test with chief constables, and possibly the city engineer will consider us in laying roads, and the chief constable in dressing his men.

My own wish is that our Association may go from strength to strength through the value of the service its members give.

COMPROMISE IN THE USE OF ILLUMINANTS FOR PUBLIC LIGHTING.

By C. H. WOODWARD, A.M.I.E.E., Public Lighting Superintendent, County Borough of Bournemouth.

Ward Harrison has said that "the task of the street lighting expert has been principally that of so distributing an insufficient amount of light as to produce the greatest practicable effect." We are all familiar with "compromise" in every walk of life, and I think it is experienced in matters appertaining to public lighting in one of its most violent forms. What, exactly, do we mean by compromise? One dictionary definition is "to adjust by mutual concession," and for the purpose of my paper, I suggest that we express this definition in a more concrete form, and try to apply it as a percentage where

$$\text{Compromise} = \left(1 - \frac{\text{actual}}{\text{ideal}}\right).$$

Thus, if the actual reaches the value of the ideal, the compromise is zero.

Compromise appears in two principal forms: Compromise in Policy and Technical Compromise; the lighting engineer never runs a clear course free from either of these encumbrances; in matters of policy he is usually harshly piloted by deficiency in funds and in technical matters by many "niggers in the woodpile."

My purpose, in this paper, is to go over some of the compromises which have come to my personal notice, not so much with a view to introducing something novel, but with a view to bringing forward points about which a variety of opinion exists, and upon some of which I myself seek information.

DAYLIGHT'S SUBSTITUTE.

Classification in this matter is difficult, and the first great compromise which faces us is associated with our attempts to find daylight's substitute.

We know of many places where the artificial lighting would be popularly described as "equal to daylight;" if, however, the two illuminations are compared, it is noted that the truncated or tunnel effect of the artificial lighting completely destroys any general comparison with daylight, and, therefore, for this purpose we are confined to small areas and a limited plane until such time as the illuminating engineer provides us with an artificial sky over the town, (say) an artificial bank of white cloud illuminated from below with floodlights and emitting (say) 0·5 lamberts.

In daylight, the field of view is illuminated by one half of the total sky, so that the vertical and horizontal illuminations are practically equal at any angle of view, as we raise our vision above the horizontal plane; the brightness of an object does not fall off, and the light background produces a flatness of field of view as compared with this unknown depth existing in the heavy contrasts produced by artificial light, this effect being a psychological rather than a physical one.

As it is impossible to raise our light high enough and to increase the solid angle—inwards—of the light source, we have to be content to use low sources and emitting light throughout a solid angle—outwards.

I know one example of an attempt to improve this condition in our 75-ft. mast at the pier approach. This has three lights in triangular spacing at the top, which provides a large area of fairly uniform illumination.

It is notable that, if no other sources of light are available, any persons or objects in the vicinity of the post are illuminated horizontally, causing heavy vertical shadows, while outside a circle of 150 ft. diameter on the ground the illumination is equally horizontal and vertical, and as the tolerance of the sky is from 0·5 to 2 lamberts, I suggest that we take an annulus where this tolerance is not exceeded; also, where the vertical and horizontal components of the illumination do not vary more than *plus* or *minus* 2 p.c., this will give us an annulus of illumination on the ground roughly 71 ft. inner diameter and 79 ft. outer diameter, or of total area 3800 sq. ft.

Within this annulus the distribution will be comparable with daylight, and if we consider the useful cone of illumination to be that associated with a spacing to height ratio of 4 to 1, the compromise can be evaluated:

$$1 - \frac{3800}{\pi(2 \times 75)^2} = 1 - 0{\cdot}054 = 0{\cdot}946 \text{ or } 94{\cdot}6 \text{ p.ct.}$$

compromise on distribution.

This method is plainly only useful where large open areas have to be illuminated.

ORDINARY STREET LIGHTING.

For ordinary street lighting we shorten the mast and increase the number, largely sacrificing horizontal illumination and substituting vertical, together with reflected light from buildings, &c. This provides an illumination upon distant objects largely vertical and comparable with that which occurs from a car headlamp, which, while valuable for showing up obstacles, distorts and magnifies by excessive silhouette and shadow in the manner all motorists are well aware of when travelling at night over a broken road surface, when the headlamps exaggerate the contour; this effect is always present in the

usual street lighting, and while not greatly noticed by the user, exerts a baleful psychological effect.

I have only referred to the distribution compromise. Another compromise has to be made with regard to the spectral character of the light emitted; this, however, in the case of the well-adjusted gas mantle or the gasfilled tungsten lamp is of minor importance as compared with distribution. The useful zone is increased in two ways: (*a*) by means of suitable reflectors, (*b*) by means of refracting glassware; this is very valuable, particularly where electric lamps are concerned, and the compromise can be greatly reduced by their use.

In the gas lamp we have a notable case where difficulty is experienced in directional control other than that already inherent in the shape of the "bag" mantle; the arrangement of a cluster of mantles in the form of a cone gives an improvement, and I await the advent of a cone formation, apex downwards, with concentric reflecting vitreosil chimneys to prevent the gaseous products from one tier of mantles interfering with those above it; also if the "chimney" could be metallized in any manner to increase the specular reflection, a great step forward in the matter of light distribution would be gained. I think this is a matter well worthy of the attention of the silica manufacturer and manipulator.

The electric lamp lends itself to use in conjunction with reflectors and refractors; as, however, these add to the number of reflecting surfaces interposed in the projected light, each surface usually reflecting the light away from the desired direction, it is not as efficient as it might be, and I look forward to the time when the refracting device for various openings and angles will be incorporated in the bulb of the lamp itself, cheaply.

It has been usually considered necessary to protect high wattage gasfilled tungsten lamps with an outer globe, well ventilated; this provides another glass surface to become obscured by dust and to reflect and absorb light uselessly. I have had fifty 500-watt gasfilled lamps in use since 1919, on the sea-front, exposed and with no protection whatever against rain and wind-driven spray; during this period I have not had one failure which I could attribute to this treatment; forty of these lamps are arranged as four series circuits of ten 50-volt lamps each and supplied at 500 volts from our tramway power station. The compromise which was effected in the installation of these particular lamps was the abolition of an outer protecting globe and the substitution in its place of an oversize bulb to provide more uniform gas circulation in the bulb and to avoid excessively hot spots. This has proved effectual.

The lighting unit utilizing these bulbs is of interest, and illustrates one of those little technical compromises which the lighting engineer is occasionally called upon to exercise in the interest of economy. The top part of the unit will be recognized as the usual housing for the mechanism of an arc lamp, and, with a little re-designing, this mechanism, together with the cut-out and substitutional resistance, operates to maintain continuity in the event of filament failure, the lower part of the arc lamp being cut away, and a specially designed enamelled reflector attached to the casing together with a "Goliath" holder. This unit has a very pleasing appearance both by day and night.

If the cables on 500 volts d.c. in the vicinity of salt spray could only be relied upon to give as much satisfaction as the lamps I should be happy.

EFFECT ON MOVING TRAFFIC.

I should like to show, at this point, a little experiment which I carried out in the vicinity of these lamps. It has been stated and denied that lighted areas exert a "moth and candle" effect upon fast moving traffic. Some of my audience will perhaps have experienced the "pulling" effect when driving a car and approaching another with bright headlights. My experiment, to show this effect, if any, was to get a friend to drive his car with a single headlamp along the Undercliff Drive without knowing the object, and to drive fast and as straight as possible while I exposed my camera upon a portion of the drive from the top of the cliff. The very interesting result can be seen to be an inverse "moth and candle" effect, suggesting that the bright areas gave the driver confidence to explore the terrain, and the dark patches forced him to seek the protection of the kerb. He could not believe he had done this when he saw the photograph, as his intention was to drive straight as requested.

One of the most difficult compromises to be adjusted is that effected between the desire to decorate a roadway with trees and to illuminate both the roadway and the footpaths adequately with a limited budget. From the decorative and æsthetic points of view, it is a delightful suggestion to turn each wide thoroughfare into a shady avenue, and an aerial view of Bournemouth shows that there are few roadways devoid of trees. This is very distressing to the lighting engineer.

The position of a post on a sharp bend in the road usually calls for a little adjustment in the scheme. If the lamp is placed at the "peak" of the concave bend it lights the greatest area, but it faces the traffic in either direction and may produce "glare," also vehicles with large "overhang" driven close to the kerb may endeavour to carry the post with them. If the post is placed on the convex "peak," the lighting of the approaches to the bend is reduced, but the glare is reduced. I consider this is best and that the spacing distance of the lamps on either side is reduced to improve the lighting of the approach to the bend.

It has been shown that great uniformity in artificial light distribution is undesirable and no doubt there are present those who, like myself, deplore the excessive use of semi-opaque bowl fittings making use of excessively bright ceilings as a source of illumination for indoor lighting. What is more soothing and æsthetically delightful than to go into a spacious dining room with well-shaded fittings emphasizing the table furnishings and throwing the room surroundings into shadowy relief. This same room, illuminated from the ceiling, gives as much prominence to the wallpaper and the distant corners as to the dining table, making the whole scheme bizarre and vulgar. The same can be accomplished in street lighting, and rather than make a large open space an overlit and glaring area like a sunlit desert, the lighting engineer, by the careful choice of lighting unit and position, can do much to change the space into an Aladdin's Cave without sacrificing efficiency from the traffic point of view and probably with a definite economy.

All this is suggestive of an æsthetic artistry which is only acquired by a careful assimilation of the valuable technical data already available, together with an intelligent exercise of compromise at every post and lighting unit installed.

ORNAMENTATION.

Decorative ornamentation is a thing about which compromise has to be made. We see on the one hand the uncompromisingly plain tubular post which blatantly holds up a plain undecorated 100-watt lamp with pieces of rectangular mirror glass to direct the rays, and, on the other hand, we see overdecorated supports containing dolphins and mermaids and crowned with a massive filigree dome with several pendant or bracket lights, these probably being lanterns with no further intention than to exhibit their ornate appearance and the bad taste of their originators. An intelligent compromise has to be sought by the lighting engineer between these two conditions, and I personally would like to see more use made of a town's "Coat of Arms" in the design of its posts. It is a pleasing characteristic in some towns, which is immediately noticeable upon crossing its boundary; it claims an individuality, and is one of those things which calls for unconscious attention.

The question of decorative compromise is seriously affected in the case of the modern gas lamp. The modern efficient lantern requires a preheating chamber, an efficient chimney, a large globe, an elastic suspension, a governor, a controller, and other gadgets such as mixture controls and by-passes. How all these ingredients are going to be incorporated in a decorative scheme combining pleasing appearance with efficiency is difficult to foresee. A pressure governor which can be incorporated in the lantern and which will stand the high temperature while being perfectly reliable is badly needed, and the same may be said of the controller. At the present time we accept them as separate attachments, largely because their unreliability calls for separate detachment. It may be said, in extenuation, that these items can always be made a part of, or included in, the decorative scheme. I would say that "any decorative scheme which has to be a foster parent to a pressure governor and a controller, is foredoomed as such."

It is in this matter of decorative compromise where the electric filament lamp has advantages over the gas mantle. It requires a "smaller size in hats," which hats may be practically of any shape without upsetting the draught; it can be enclosed in any shape or size of decorative or directive lantern; it can be "burnt" at nearly any angle. These are the characteristics which largely determine whether it is worth while to pay the extra cost which this illuminant frequently demands.

THE RATIO OF COLORANT BASE.

One compromise which the lighting engineer should carefully watch is that one which the gas mantle manufacturer is called upon to exercise. I refer to the ratio of colorant to base. This ratio requires very careful adjustment for each type of mantle, and only those mantles which provide this condition should be used. Many lighting engineers rely upon the observations made upon mantles under service conditions to provide them with this information. This, I think, is faulty and leads to error, as the average burner conditions of entrainment and mixing do not provide a just basis upon which comparisons may be made, in addition to which the external atmospheric conditions of humidity and pressure are variable from point to point. The question as to the best mantle can only be decided by the combined use of an experimental burner bar fitted with pressure governor, meter, burners with good mixture control so that the zone of "high combustion" may be made to coincide with the "bag" of the mantle, and a photometer to watch the variation in luminosity or to make comparisons. A further useful adjunct is a micro-telescope with dark glass with which to watch for disintegration of the mantle fibre both generally and specially for local disintegration due to impurities which act as fluxes and produce holes. Careful attention to this matter can easily raise the amount of light provided to a town by a considerable percentage, and I look upon this point as being equally important with that of burner regulation.

A somewhat similar compromise has to be made by the electric lamp manufacturer. He has to adjust the compromise between luminous efficiency and life of filament, and this is arranged upon a rough basis of 1000 burning hours. This compromise has been viewed from another point, and it has been proposed that its adjustment shall be subject further to the cost per unit at which the lamp will actually be run.

Compromise has to be made to please the "man in the street." He judges not by the plotted records taken laboriously by means of a photometer; he does not immediately appreciate a high minimum illumination, but rather inclines to praise a high average illumination; he does not mind walking thirty yards to read the latest football results in the vicinity of a post, and, if this is easy of accomplishment, he would incline to praise the arrangement possibly to the detriment of another system giving a much greater total illumination. This raises the question as to how much shall be "charged up" to "appearance" and "credited" to "efficiency." I incline to the thought that a lighting unit with a practically concealed emitter and with a good polar curve does not appeal to the public as well as a liberal light source with possibly a poor polar curve. Face values naturally appeal, and to appreciate fully the efforts of the lighting engineer, more interest has to be encouraged on the part of those who benefit by his labours.

Opinion of the "Man in the Street."

My last review of "Compromise" will be devoted to the great compromise the "man in the street" makes unconsciously in the use of the illumination provided. In an ordinary good installation, where the diversity factor is not greater than 20/1, it is an interesting experiment to watch a person travelling along the pavement and to note critically the general character of the image presented to the eye, while the observer views the observed from a point (say) 60 ft. from the post. He will see the person clearly defined as to colour of clothing and features under the post, and, for (say) a distance of 10 yards beyond this point, he will note that the features are now uncertain, the clothing cannot be distinguished, and a little further on it will be noted probably that he is seeing the outline of the person observed against an illuminated background or silhouette. Under ordinary artificial lighting conditions the "man in the street" is continually changing his method of viewing from direct to silhouette. At one instant he is looking at a bright object against a dark background and an instant later he is viewing an object almost devoid of brightness but outlined against a brighter background. During daylight this condition applies to a small degree, but with directed artificial lighting the condition of "seeing by silhouette" predominates, and only in special areas is "positive" vision usefully employed. The public are therefore called upon to make a compromise continually in that they have to substitute the "negative" method of silhouette viewing for that of direct or "positive" illumination. During daylight the object viewed is usually of a brightness comparable with the background, and the average disparity would probably not exceed 20 p.ct.—taking averages and ignoring colour contrast—whereas with artificial lighting the disparity reaches closely to 100 p.ct. This suggests a natural classification for public lighting, one class which provides an illumination of the "positive" type, in which viewing is secured with a silhouette to bright ratio of not more than (say) 40 p.ct., and applicable to congested traffic areas, large open public spaces, business centres, and pleasure centres; the other class of the "negative" type, which utilizes silhouette together with "glint" chiefly, and which constitutes very largely the bulk of the present day suburban lighting.

This being the case, it behoves the lighting engineer not only to concentrate upon his lighting unit, but also to pay attention to the background, with a view to improving its reflecting factor. It is necessary for him to emphasize at every opportunity the great necessity for the road-making authority to co-operate with him to make the roadway safer for transit by employing materials which will improve the reflection factor of the roadway which has so notably suffered since the general use of tar and bitumen products. Careful attention to this detail will no doubt, in due time, provide a top dressing which, while possessing durability, will restore that "seeing facility" which was associated with the old lighter roadways, and which is produced by the lighter background, and which is also simulated by the glint effect noticeable on a well polished—by traffic—"bitumen" road. To this useful end, a little compromise in the matter of durability may be considered by the road makers, if it should be necessary, to be worth while to secure greater safety and security to the wayfarer.

PRIVATE LIGHTING AS AN AID TO PUBLIC LIGHTING.

By J. S. Dow, Hon. Secretary, Illuminating Engineering Society (London).

The conception of "public lighting" has been broadening during the last few years. It is no longer regarded as comprising merely the lighting of streets, and in selecting the title of his paper the writer has in view a survey of various other forms of lighting with which the public lighting engineer is concerned.

During recent years, the public lighting engineer has had to add to his primary duty of attending to the public lamps the study of the use of light as an aid to the control of traffic. In the future, maybe, local authorities will ordain that every house must bear its appropriate luminous and legible number, and that for the benefit of the stranger all essential public buildings shall bear a luminous description of their functions. The supervision of such devices may well be added to his duties. Furthermore, floodlighting and the arts of advertising or giving information by means of light, which at present are used almost exclusively by private persons or firms, may also prove of public service. The public lighting engineer of the future should, therefore, be an illuminating engineer, having a specialized knowledge of certain applications of light, but taking within his province every form of lighting that contributes to render a city visible by night.

Inherent Difficulties of Street Lighting.

Theories of street lighting are still based very largely on the original conditions, when a few public lamps, at long intervals, furnished the only available light in a street. It was scarcely contemplated that such lamps could *illuminate*, in the sense of rendering objects easily visible. They served rather as isolated beacons, and the difficulties of modern street lighting arise largely from the fact that in the minds of many people this idea still survives. Illuminating engineers, in planning how to make the best use of the limited light available are secretly aware that it is an almost impossible problem to furnish adequate illumination from lamps at intervals of 100 ft. or more. Experiences at Sheffield last year illustrated the difficulty of providing reasonably even illumination over the roadway, without at the same time creating glare from light-rays coming at angles slightly below the horizontal.

But the conditions are abnormal in other respects. The eye, exposed to the surrounding gloom of soot-darkened and feebly illuminated surfaces of neighbouring buildings, is in a state of dark-adaptation. Its sensitiveness to the isolated bright specks of light seen against this sombre background is enormously increased, and its powers of perception are at a minimum. (It is a fact that, in the case of many eyes, the enlargement of the pupil aperture diminishes acuteness of vision, just as a large stop on a camera lens impairs its definition.) Glare is largely a matter of excessive contrast. Early workers laid down the rule that the contrast between the brightest and least bright objects within the field of vision should not exceed 100 : 1—a condition that can be readily complied with in the case of interior lighting, but is almost always violated in street lighting.

Moreover, in any moderately well lighted interior, objects are seen in their entirety because they are illuminated by diffused light coming from many different directions. But in a street this condition is not realized. Light is furnished only by individual lamps at long intervals. Frequently, only the outlines of things are seen, sometimes as an object which is somewhat lighter than its background, but quite as frequently "in silhouette"—*i.e.*, a black outline seen against a splash of light on the wet or shiny roadway. It is not surprising, as was well illustrated in Mr. J. M. Waldram's paper last year [see "Journal," Vol. 183, p. 208], that such conditions render the prediction of visibility a difficult and somewhat complicated problem.

The problem of street lighting would be simplified if lamps could be spaced at closer intervals, but this involves expense. When improvements are contemplated it is simpler and cheaper to instal new fittings on the existing posts where they stand, than to design a complete new installation. The question of the permissible expenditure on street lighting is one on which members of this Association can speak with much greater expert knowledge than the writer. It may, however, be suggested that such expenditure is not at present determined by any economic law, but is merely a crystallization of past experience—and that the limit of expenditure is elastic and depends primarily on the esteem in which the public lighting is held by ratepayers. Apart from the technical difficulties of street lighting, referred to above, there is the psychological difficulty that there is not the same direct appeal to self-interest as is the case when one approaches the manager of a large shop or factory. Nevertheless, much might be done by steady educational effort to raise the status of public lighting and to create a civic pride in the lighting of a city, to which local authorities would quickly respond.

STREET LIGHTING BY PRIVATE AID.

There is, however, another possibility—the provision of special public lighting by private aid. Instances are furnished by the "parade lighting" installed in some streets in London, Sheffield, and other cities, maintained partly by a contribution by local merchants. In the United States this plan has been adopted on a much more extensive scale. Occupants of stores and business premises in important streets have consented to share in the initial cost of the installation, and have responded readily to the argument that better lighting attracts custom and brings trade. This support enables more generous lighting to be provided, but the introduction of "a blaze of light"—which in practice means "glare"—should be discouraged. Those who contribute to such supplementary lighting may feel that their own wishes should be respected; but the needs of those who use the street must also be studied. Hence this additional lighting should be provided by dignified and pleasing units, and the transition from this brightly lighted area to the lower adjacent illumination should be *gradual*, so that drivers of motor vehicles are not dazzled by sudden contrasts in brightness.

Various methods of enlisting private support for public lighting in the United States have been summarized in recent papers by Mr. L. A. S. Wood. Assessment of property-owners on a frontage basis is usual in important streets where special decorative lighting is installed. The relief thus afforded enables the municipality to spend more in levelling up the general lighting of the city as a whole.

RURAL HIGHWAY LIGHTING.

If the principle of seeking special contributions for public lighting from those most directly interested be approved, it would seem that the motorist might well be invited to bear part of the cost of certain forms of public lighting, especially on the arterial roads now becoming general.

Public lighting engineers are well aware that even in a city it is not always feasible to obtain street lighting as effective or generous as one would like. In the case of a rural highway passing through numerous country parishes the problem of securing adequate lighting out of local rates is still more difficult. This, possibly, is another case where private enterprise, as represented by motoring organizations, might step in, though it might be considered that the ultimate solution is to treat the lighting of such highways as a national matter, and for the State to assume responsibility.

The problem of rural highway lighting has likewise been exciting interest in America. Some doubt appears to exist in many States whether the authorities possess powers to deal with the problem. Meantime property owners in the vicinity of Detroit, Albany, and Cleveland, impatient of legislative provisions, have paid for lighting installations by private subscription.

Whatever be the form of control exercised over the lighting of arterial roads in the future, one would like to see the lighting schemed out on an ordered plan. This applies particularly to the design of traffic and direction signs, which formed the subject of a paper before the Association by Mr. W. J. Jones last year. Here we have developing what is almost a new branch of illuminating engineering, and one would like this development to proceed in an orderly way, with as little offence to natural beauty as is possible. In this mechanical age it is perhaps futile to lament that our main roads are becoming increasingly like railways; but something might be done to ensure that luminous traffic signals achieve their object without being too unsightly, to induce some restraint in the lighting up of petrol stations, wayside garages, &c., and to keep within bounds the growth of illuminated advertisements by the side of country roads—which, in some localities, may ultimately become almost as common as in the cities.

PRIVATE LIGHTING AS A SUPPLEMENT TO STREET LIGHTING.

Whatever be the future of private display lighting on rural roadways, it has already become an important element in the illumination of cities. Much of the exterior lighting adopted by stores, restaurants, or places of entertainment in their own interests forms a useful aid to public lighting. "Concealed" show-window lighting, for example, helps to enliven a street, and relieves the excessive contrast between public lamps and dark surroundings. The diffused light is just what is needed to soften shadows. The growing practice of keeping such windows lighted after business hours should be encouraged by the granting of special rates for "after-hour" lighting. Such lighting now tends to assume many novel forms, and to be combined with "architectural lighting," of which many striking examples were given in a recent paper before the Illuminating Engineering Society.* These methods are based on the use of concealed lamps, so that glare is usually absent, and the light is well diffused. The illuminated façades and canopies adopted at some Continental establishments utilize light on a remarkable scale. Thus the installation outside the Galleries Lafayette, Paris, consumes as much as 625 KW.—an amount which is roughly equivalent to the total consumption for public lighting in such towns as Epsom, Horsham, and Windsor. "Architectural Lighting" is somewhat difficult to define precisely, but its main feature is that the lamps and lighting appliances form part of the general architectural scheme and are built into the design. So far as exterior lighting is concerned, it is at present chiefly identified with the illuminated fascias, canopies, and descriptive designs which have been adopted by leading stores and places of entertainment abroad. But the art is at present in its infancy, and if the co-operation of the architect is secured it may develop in other directions.

Equally interesting, from the public lighting engineer's standpoint, is floodlighting. Those interested will find some technical details in the admirable paper on this subject read by Messrs. W. J. Jones, H. Lingard, and T. Catten, before the Illuminating Engineering Society, in 1927. One of the first essentials for successful floodlighting is a light exterior. Many blocks of buildings now going up in London offer admirable subjects for treatment. On the other hand the grime-encrusted surfaces of buildings in many of our industrial cities present difficulties, and the future development of floodlighting in this country seems to be linked with the question of smoke abatement.

A third source of supplementary street lighting illumination from illuminated signs may also be of value. It is said that in Broadway, New York, the diffused light from the sky-signs completely masks the street lighting, and the illumination afforded from the exteriors of places of entertainment in some London streets is certainly much in excess of that provided by the public lamps. Many forms of illuminated signs, especially those of a pictorial character, are ideal as supplementary illuminants. Others involving flashing lamps of great brilliancy are perhaps open to the objection of distracting the eyes of drivers, and may hinder rather than aid the control of traffic. The volume of light available from these various forms of supplementary lighting tends to increase continually. In some of the provincial cities, where they are less in evidence, one is conscious of something missing. Streets are apt to have a gloomy appearance by night, even when the public lighting is of relatively high intensity.

It is difficult to set a limit to the future possibilities of these three applications of light. One can conceive in the future streets lined by luminous light-surfaced buildings where the intrusion of lamp-posts would seem an absurdity. If the idea of incorporating lighting elements in the frontages of buildings thus became general, a natural step would be for the authorities to require provision to be made for the inclusion of public lighting apparatus when the plans are passed. Streets would then be lighted from units mounted at frequent intervals on the frontages of buildings, and falling naturally into place in the design; the actual street area would be freed from the obstruction of lamp-posts and from the unsightly appearance of cables spanning the roadway.

This conception of a street flooded throughout by diffused light, in which public lighting and private lighting merge into one another and become one, may seem visionary. But even at present there are many ways in which owners of buildings could help towards the solution of the lighting problem. One simple but obvious aid would be to keep the surfaces of buildings moderately clean, so that they serve as diffusers of light. They might also, when desired, help by consenting to the attachment of brackets to frontages of buildings. This practice, which would often render lamp-posts unnecessary in narrow streets, is usually difficult to carry out in this country, unless (as in the City of London) special powers have been obtained. The writer understands that in Cologne, where the street lighting has recently been remodelled, the centrally-suspended lamps are supported throughout from brackets attached to the buildings, and with a spacing ratio of only three to one.

REGULATION OF PRIVATE LIGHTING.

The methods of lighting discussed above, in so far as they form a part of the lighting of a city, are of direct interest to local authorities and to the public lighting engineer, by whom much can be done to aid or hinder their development. Attention has frequently been called to the extraordinary variations in existing rules and regulations governing exterior lighting. In various cities permission has to be sought from quite different authorities (sometimes several in one and the same town), and each has its own code of rules. In some cases these rules are concerned mainly with details of construction and have not been revised for many years. It is singular that they seem to be rarely framed to give guidance on the point of greatest interest from the standpoint of the illuminating engineer—the degree of brilliancy or constancy of the light. Floodlighting installations are likewise subject to varying restrictions. In some Continental cities the arrangements seem more flexible. For example, it is not unusual to find quite a number of floodlight projectors mounted on tramway poles for the purpose of floodlighting neighbouring buildings. In this country one of the first difficulties, and often a serious one, is to find a suitable site for the floodlighting projector.

If it were possible for local authorities throughout the country to be brought into agreement upon broad general principles in regard to exterior lighting (floodlighting luminous signs, shop-façades, &c.), and if such problems could be invariably referred

* "Architectural Lighting," by Waldo Maitland, Illum. Eng., April, 1929.

to the same official (eventually, perhaps, the public lighting engineer) for decision, this would help greatly towards the extension of such supplementary lighting. Many existing regulations would probably be found to be obsolete and unnecessary, but new ones concerned with the actual application of the light might be found expedient.

Exterior lighting by private concerns should not be dismissed as a nuisance. Neither should it be allowed to grow unchecked. The appearance of a city by night is a matter of concern to all its citizens. Authorities are justified, in the public interest, in forbidding unsightly and glaring signs in undesirable places, but they should encourage in every way supplementary lighting which serves the public interests as well as those of the advertiser. Furthermore, the use of such methods of lighting is no longer confined to purely advertising purposes, and it is likely to play a larger part in the official illumination of cities in the future.

Lighting of House-Names and Numbers.

With the continually extending use of luminous devices by merchants and entertainers, other users may become more enterprising. Leading railway companies are already proving the value of luminous signs as a means of giving information. The Underground Railways of London furnish a familiar example of enterprise, but it is to be hoped that the time is not far distant when every railway station will bear its name in bold and luminous letters. The writer has always felt that the names of streets in leading cities are poorly revealed. The lettering is sometimes too small, and the casual illumination from the street lamps frequently inadequate. Is it impracticable for the names of at least the main streets to be indicated in bold, luminous letters

Why is it that, whereas shops, theatres, and restaurants vie with each other in using light to impress their existence on the public, the names of places of business or professional men are rarely revealed at night by an illuminated sign? Would it not be an advantage if post-offices, police stations, libraries, fire stations, and similar public buildings, could all be furnished with a distinctive illuminated description? Would it be too undignified for even Government offices, churches, and important public buildings to embody a luminous device over their doorway—so that the stranger may be saved much needless inquiry?

This leads one to a point that has been the subject of frequent reflection in recent discussions—the provision of illuminated numbers for houses in suburban streets. Some local authorities have recently made it obligatory for all houses in suburban districts to bear numbers as well as names. Even so the problem of locating a house in an unfamiliar neighbourhood by the light of a distant street lamp is frequently an exasperating one. Is it beyond the power of local authorities to insist that such numbers should be adequately illuminated? This practice, the writer understands, is already obligatory in Stockholm, Helsingfors, and other cities abroad, where in some cases the dimensions of the sign and the nature of the lighting are standardized. In Germany, an enterprising step has been the formation of companies, in which the local electricity supply undertaking, contractors, and the public are interested, and which provide standard illuminated house numbers connected to the street mains, attending to upkeep and renewal and charging a small annual rental.

Civic Lighting.

The writer would like to emphasize one important development of recent years—the use of light as an element in civic display. Floodlighting, architectural lighting, and illuminated signs, have been hitherto regarded as the publicity weapons of the merchant or the entertainer. But they have many uses. On the occasion of the visit of this Association to Brighton, in 1927, the writer suggested that floodlighting would greatly improve the appearance of the sea-front by night and might eventually become part of the regular entertainment equipment for visitors. In particular, it was suggested that hotels might make use of such lighting, thus bringing their existence to the notice of visitors, besides enhancing the appearance of the sea-front.

Just as an enterprising local authority plants trees and lays out parks and gardens to improve the appearance of a town by day, they will come, more and more, to make use of artificial light to reveal their towns or cities by night. There have been quite a number of examples of such special lighting in this country. The floodlighting of the Pavilion with coloured light, on the occasion of the visit of the "I.M.E.A." to Bournemouth, in 1927, may be recalled as an effective pioneering installation. Similar enterprise was shown in connection with the recent "I.M.E.A." Conference at Torquay. Yet another example was the floodlighting of the city buildings in Liverpool during the "civic week" last year.

An interesting experiment has recently been made in a number of leading cities in Germany, where local authorities and lighting interests joined efforts in organizing "festivals of light," during which the cities were brilliantly illuminated. Floodlighting formed a leading feature of these displays. During the progress of the fête in Berlin as much as 20,000 KW. was thus expended. In Prague, on the occasion of the celebration of the tenth anniversary of the Czechoslovak Republic, many of the churches and historic buildings in this ancient city were floodlighted.

The results of such displays have apparently more than fulfilled expectations. From the civic standpoint they helped to advertise the cities illuminated, bringing many visitors and increasing the volume of trade during the festival period. From the standpoint of the lighting interests the results were equally satisfactory. To many people the displays were a revelation, and the general expenditure on lighting in these cities has been raised to a permanently higher level.

The use of light to celebrate festive occasions is a practice of ancient origin. Methods available to-day render possible displays on a far greater scale and more artistic in conception than in the past. In particular, there are great possibilities in floodlighting with coloured light, such as aroused so much interest at the North-East Coast Exhibition this year. Yet it should be emphasized that these special displays fall short of what might be possible if local authorities and private interests would co-operate in the introduction of civic lighting as a permanent feature—a continuous effort to render their city beautiful by night. Successful floodlighting and architectural lighting demand long preparation. Ideal results are only possible when the building to be illuminated and the method of lighting are planned together, and when the architect and the illuminating engineer can confer at an early stage in the design. In the case of old buildings, the lighting can only be adjusted to meet existing conditions. But when new buildings are planned such co-operation might well be considered.

In applying artificial light to a city by night, however, the designers have certain advantages. The sun sheds its light on boulevards and slums, on buildings of architectural distinction and on monstrosities. Good and bad alike are revealed. By night, however, the artist can select what he will reveal. Noble exteriors, a charming vista by the riverside may be illuminated. Less happy aspects of cities may remain mercifully hidden.

Conclusion.

There are, of course, other forms of public lighting, such as the illumination by night of public tennis courts, parks, and places of recreation. While our climate is doubtless an obstacle, it has always seemed to the writer that more might be done to encourage out-of-door life in our parks by night, in the manner familiar in Continental cities, where illuminated cafés and dancing areas afford innocent enjoyment during summer evenings.

The chief point that the author wishes to bring home is that the application of artificial light in a city is a problem that should be considered as a whole. The use of this light for the benefit of citizens generally and in the interests of trade should not be entirely dissociated. Local authorities, merchants, and entertainers, and undertakings supplying gas and electricity should get together and make plans for the use of artificial light for their common benefit.

When illumination is so regarded, we can see that there is really scarcely any form of exterior lighting which is not in some degree of interest to local authorities and to the public lighting engineer, whose work in the future may be of a much more varied and comprehensive character than it usually is to-day.

LIGHTING AND RATING.

By Ex-Bailie James MacDougall, Convener, Watching and Lighting Committee, City of Glasgow.

The purpose of this paper will be well served if I succeed in directing the attention of the various authorities represented here to the need for some definite legislation on so important a subject as public lighting.

I think it will go unchallenged that while many of the services undertaken by the elected representatives in town or city councils might be quite as efficiently carried on by private companies, the lighting of streets and roads is one rightly to be discharged by the civic body. Allowing that the public lighting service is one of the primary duties devolving on the ratepayers' representatives, the setting up of a suitable department to deal with this work and the appointment of an official to superintend the department's activities, responsible to a special committee, appears to me the procedure most likely to result in economical and efficient working.

So at least thought Glasgow's Civic Fathers, and there has been an independent official in charge of public lighting, directly

responsible to the Watching and Lighting Committee, or equivalent body, since 1843. The Glasgow Police Act of that year authorizes the Board of Police Commissioners to appoint an Inspector of Lighting, and records show the activity of a Superintendent of Lamps from the beginning of the nineteenth century.

Though the above appointments were carried out under local Acts, the position in England and Wales seems in every way to have been as favourable for the development of the lighting service, the Act of 1830 (King George IV., C. 27, Sect. 33) providing:

> That it shall be lawful for the said Inspectors and they are hereby empowered from time to time to cause such lamp irons or lamp-posts . . . to be fixed upon or against the walls or palisadoes of any houses, tenements, buildings, or enclosures . . . or to be erected in such of the said roads, streets, and places within the limits of the Act as they shall think proper, and also to cause such number of lamps of such size and sorts to be provided and fixed upon such lamp irons and lamp-posts as they think necessary for the lighting of any such roads, streets, or places, and cause the same to be lighted with gas, oil, or otherwise for such number of hours in any twenty-four hours as they think necessary.

The foregoing Act was repealed by the Lighting and Watching Act of 1833 (you will notice lighting comes first in those days), but the later Act contains the quoted section as section 45, and, in addition, provides protection for lighting plant under section 55 by laying down the penalties to be imposed on any person wilfully breaking lamps or lamp-posts or wilfully extinguishing the lights. To meet the expenditure entailed in carrying out the various services under this Act, section 9 provides that "The ratepayers shall fix and determine the total amount of money which the inspectors shall call for in one year."

The position in Glasgow was further improved by the Glasgow Police Act of 1866, section 66, authorizing the appointment of an Inspector of Lighting and defining the duties of the Inspector under section 358:

> The Inspector of Lighting shall be responsible to the Board for the erection, maintenance, and renewal of the said lamps; for the proper maintenance and renewal of any lamps now in use; for keeping in order all such lamps; for lighting them during such hours as the Board may from time to time direct; and generally for the complete state of efficiency of his department.

It is difficult to understand the next step in the English position which seems one of retrogression. The Public Health Act, 1875, which supersedes the earlier Act so far as urban districts are concerned, dismisses the street lighting with a perfunctory: "May provide such lamps, lamp-posts, and other materials and apparatus as they think necessary for lighting same."

In Scotland, the Burgh Police Act (Scotland), 1892, applying to all Burghs in Scotland except Edinburgh, Glasgow, Aberdeen, Dundee, and Greenock, section 99 reads: "The Commissioners shall make provision for lighting in a suitable manner all the streets, and all other places within the burgh which in their judgment should be lighted at the public expense, and shall provide and maintain such number of lamps, lamp-posts, as may be necessary for that purpose."

I think it will be agreed that where you have an official specifically appointed to look after a certain service, that service will naturally receive more consideration than if the work is only one of perhaps several duties allocated to another official. In Glasgow, at any rate, the policy has proved an unqualified success, resulting in a lighting department, I think, worthy of the second city of the Empire.

While on all hands the demand is for a reduction of the local rates, no community whose elected representatives are giving serious consideration to those matters vitally affecting the welfare of the citizens they represent can afford to dismiss lightly the claims of public lighting for adequate financial support.

It must be recognized that with scarcely an exception the majority of the cities and towns in Great Britain are simply playing with the question of street lighting. From figures recently collected by Mr. J. F. Colquhoun, of Sheffield, which I take the liberty of reproducing, the expenditure per head of the population per annum is given:

	s.	d.
Leeds	4	4
Glasgow	4	2
Manchester	3	6
Newcastle	3	4
Dundee	3	4
Liverpool	2	9
Leicester	2	7
Edinburgh	2	5
Aberdeen	2	4
Sheffield	2	4
Birmingham	2	2

It will be seen that only two cities spend a sum of 4s. per head of the population per annum on street lighting, while in a number of cities the amount does not exceed 3s. A recent writer in an American journal states that no progressive city should be spending less than two dollars per head per annum on this service, and I am in entire agreement with our American friend. The same writer proceeds to lay down standards of illumination the fulfilment of which would be for British lighting engineers an entry into Paradise, but no good purpose is served in giving details in view of the British Engineering Standards Committee on the Specification for Street Lighting.

With regard even to the improvements necessary in order that the standard of lighting of our streets may come within suitable classes of the Specification, many engineers will feel like Moses that it will not be their lot to enter into the joy of such a Canaan.

IMPROVING ILLUMINATION IN GLASGOW.

As figures of some interest I have had the following taken out, showing the cost to convert the existing side street installations in Glasgow to give the standard of illumination specified in Class F, and of increasing the illumination of the remaining important roads and streets so that they come definitely within Class E. The present average practice for the lighting of side streets in Glasgow is 2·8-c.ft. burner, mounted 10 ft. 6 in. and spaced 25 yards. In main streets which are awaiting improved lighting there are 6·75-c.ft. 4-light burners, mounted and spaced as for 2·8-c.ft. units. It would be necessary to increase the 2·8-c.ft. units to 10 ft. 4-light burners, this necessitating a larger lantern and increasing the mounting height to 13 ft. 6 in., but no change would be necessary in the spacing. The main streets would require the replacement of present 6·75-c.ft. burners, 10 ft. 6 in. high and 25 yards spacing, by 500-watt lamps on steel poles giving a mounting height of 22 ft. at 40 yards spacing. The lower mounting height as given in the specification would, I am afraid, hardly be satisfactory in Glasgow. To do this would mean an initial expenditure of £133,500 and an additional annual cost of £87,000, meaning a lighting rate for Glasgow of at least 10d., the present limits being 9d. in the £.

Having dealt with the financial requirements to give even moderately good lighting, a few words on the raising of this money may not be out of place.

In Glasgow, until 1922, the position was that generally prevailing in Scotland, the lighting expenditure being met from the general Police rate. In England, the expenditure was included in the General District Rate under the Public Health Act of 1875, and for Rural Districts under section 9 of the Lighting and Watching Act, 1833, already quoted. The Glasgow Confirmation Act of 1914 gave power to levy a lighting rate not exceeding 6d. in the £, and this had to cover all expenditure for street and stair lighting. With well over 80,000 stair lights you will readily appreciate this was quite inadequate, and the Glasgow Confirmation Order Act, 1923, increased the maximum rate to 9d. The lighting rate for the year 1927-28 was 8·97d., and this rate was only obtained because of the exceptionally heavy expenditure on new lighting in housing schemes and the absolutely necessary improvement of the lighting of arterial routes. In addition, £6000 had to be added to the loan debt of the Department, increasing it to £63,924.

On the question of rating, the following figures will, I think, prove of interest:

—	Population.	Rateable Value.	Value per Head.	Product of 1d. in £ Rate.	Total Rates.
		£	£ s. d.	£	s. d.
Glasgow	1,034,174	11,599,163	11 4 3	43,000	14 0·3
Birmingham	955,300	6,689,011	7 0 0	25,472	14 6
Bradford	293,200	2,548,035	8 13 10	9,856	14 2
Leeds	483,952	3,386,257	6 19 11	13,234	15 8
Leicester	245,000	1,504,000	6 2 10	5,858	14 11
Liverpool	875,900	7,246,549	8 6 0	25,423	14 9
Manchester	751,900	7,015,912	9 6 7	27,300	13 4
Newcastle	288,500	2,449,923	8 9 10	9,508	12 5
Sheffield	524,900	2,620,155	4 19 10	9,872	18 8

From this you will see that Glasgow stands well ahead with the highest rateable value per head of the population as also the highest product from the 1d. in the £ rate, and this point is well worth the attention of those officials who find it very difficult to obtain the required sum to meet their lighting bill.

The figures also show the need for some system of uniform assessment procedure. Bradford, with a population of 293,200, has a rateable value of £2,548,035, while Sheffield, with nearly double the population, has practically the same rateable value.

ROOM FOR LEGISLATION.

This state of affairs suggests that there is room for legislation of a like nature to that which is before the Pennsylvania Legislature, which provides for the establishment of sound and accurate appraisal standards throughout the State. It seems to me that the securing of a separate lighting rate is a very necessary first step towards bringing the needs of public lighting before the community, and, in this connection, lighting engineers would do well to avail themselves of every opportunity of presenting such a case to the Parliamentary Bills Committee of their local authority. So far as my knowledge goes, all expenditure for public lighting in the United Kingdom is met from assessments. I can recollect an instance of a small

district where the street lighting during the winter months depended on the success of a number of whist drives, but that I think is an exceptional case. I am not aware of the adoption by any of our large cities of the American practice of defraying either the installation or maintenance costs of public lighting by part assessment and part contribution from commercial houses directly benefiting by improved illumination. In this connection I read with interest recently of a decision of the Oregon supreme court upholding the right of the city authorities to levy special assessments against properties in a business district where an ornamental lighting system had been installed, it being maintained that placing an ornamental lighting system in business districts of the municipality constitutes a local improvement, and that the property in the district may properly be assessed to pay for the benefit thus conferred.

From the attitude of local authorities in the past to this question of public lighting, it is too much to hope for any immediate recognition of the claims of the service to liberal financial support, and so we must look around for the best methods of making £1 do the work of £2.

A glance at the expenditure of any lighting department shows three outstanding items—labour, gas, and electricity. The extent to which the manual element can be eliminated in the actual lighting and extinguishing depends, of course, on the illuminant. With gas, the pressure wave method is, I think, of limited application and not in operation in any large town where the gas is supplied from various works.

Automatic Control.

The clock controller for single lamps has now reached a high state of efficiency, but again, where the law enacts that the lighting authority "shall light," it is essential that the lamplighter shall cover the area for which he is responsible, so that he can speak to having seen the lamps lit. If this inspection is carried out, then I fear the saving by the use of mechanical lighters will be negligible.

With electricity, certain conditions prevailing, I think the position is somewhat better. In Glasgow, where special lighting cables are laid, or run overhead, the relay system becomes a possibility, and permits of large areas being linked up with the ultimate pressing of the button, but I am afraid I am travelling too fast. I am concerned at present with immediate financial resources, and, unfortunately, it is not the lighting engineer's happy lot to be permitted to work quietly to his considered plans.

New housing schemes bring new transport problems, and where the fast motor traffic of a municipal or private company opens up a new route, the street lighting must receive attention, and so the sums allocated for systematic development too frequently have to be utilized to meet the emergency. Nevertheless, though the benefits of a scheme are slow in accruing, still it will be admitted it is better to pursue a progressive policy. I am afraid item No. 1 has contributed no substantial assistance to the financial problem, but there still remain the gas and electric services.

A Field for the "B.C.G.A."

The varying prices obtaining for a definite service such as street lighting prices ranging from 11d. per 1000 in Sheffield to 2s. 4d. per 1000 in Glasgow, suggests that here we have a splendid field for the operations of the "B.C.G.A." Surely if the matter was taken up, and an attractive price offered to what are after all the gas undertakings' largest consumers, a lighting unit would be possible in even our "H" class streets that would, to mention only one aspect, be a splendid advertisement for gas as an illuminant. When dealing with gas, I think we must of necessity include mantles, on which Glasgow last year spent over £5000.

To those who are faced with the steady increase in price, it is difficult to understand why the Associations which have the best interests of the gas industry at heart can stand aside and watch a policy that hastens the loss of an already lamented decreased load—namely, street lighting.

I feel hopeful that on this hand the lighting engineer may look for some assistance. I hardly think that so enterprising an industry will merely look on while the twin service, electricity, assisted I grant you by State funds, moves forward under the direction of the Electricity Commissioners to offer for street lighting purposes at least the tempting price of ½d. per unit, a decided improvement on the 1½d. presently being paid by Glasgow.

But as the gas industry cannot afford to ignore the mantle question, so the electrical industry must see to it that the price of lamps does not prove a stumbling block. It seems to me that the manufacturers of lamps are hard put to it to explain the unusual difference between the prices prevailing in America and in this country:

60-watt—1s. to 1s. 3d. against 2s. 3d.
100-watt—1s. 5½d. to 2s. against 4s. 3d.

Surely it is not too much to hope for a contribution from this source.

LIGHTING TRADES AND WELSBACH.

New Lines for the Coming Season.

Lighting.

Active preparations are being made at "Oriel House," Nos. 30-31, Farringdon Street, for the forthcoming lighting and heating season; and excellent arrangements have been planned to cope with the considerably increased business which it is anticipated will accrue as a result of the association of two such prominent firms as the Welsbach Light Company, Ltd., and Lighting Trades Ltd. Behind this association is the great experience of the Welsbach Company—the pioneers of the incandescent gas-mantle industry, over 42 years ago.

New showrooms have been constructed which are exceptionally well laid out, and a visit to these is an education in itself. Most of the more popular lines of each Company will be continued this season; and new catalogues should be in the possession of all gas undertakings at an early date. An excellent range of new season's lighting fittings are on view in the showrooms, together with an extensive selection of glassware. Among the latter are many patterns of particular attractiveness in imitation marble, cut opal, hand-painted opal, pearlite, and satin etched.

As regards burners, the Welsbach Company are continuing

The "Lobby" lamp.

White pearl opal globe with floral decoration.

The new "Renown" indoor lamp.

the well-known "Eddystone" burner in all sizes. This burner will also be supplied in future with the popular "Renown" all-clay superheaters. Another old favourite is the two-wing aluminium burner, known as the "Calshot." This is made of very heavy gauge metal, and is supplied in all sizes. Practically all the other types of burners previously marketed by the Welsbach Company under various "Lighthouse" names will be available during the coming season.

Among Lighting Trades burners, the "Renown," with the excellent superheaters of that name, will again be prominent. These burners embody all the latest improvements in construction and design, including coin slot gas and air adjusters. All parts are turned from solid bar; the gallery and deflectors being made from heavy gauge sheet aluminium which does not corrode under the influence of the products of combustion. Included in the range are the "Glasmi" and the "Briton" burners.

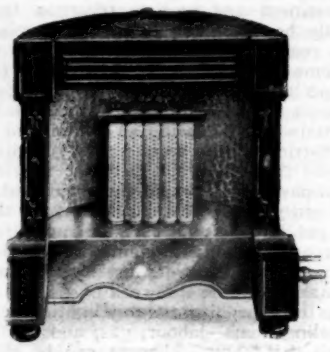
For indoor and outdoor lighting the "Silva" and "Gladiator" types will be continued, but will in future be known as the "Renown" lamps. These will be supplied in steel and copper casings, for 2, 3, 4, 5, 6, and 8 lights, and all will be fitted with the "Renown" all-clay superheaters. For indoor lighting, where positions are draughty, the firm have an excellent lobby lamp, fitted with all-clay superheaters for 2 and 3 lights.

In connection with street lamps, special attention may be drawn to the square and parade types, supplied with 3 and 5 light all-clay superheater chambers. Mention should also be made of the "Renown" magnesia cluster superheaters for public lighting purposes. They embody special and unique features, and their peculiar construction render gauzes or other baffle arrangements unnecessary. Moreover, there is no possibility of any dust deposit, and they are absolutely silent in lighting and extinguishing. Manufactured of magnesia throughout, they are non-corrodible and are adaptable to any existing public lighting system. They are supplied in 2, 3, 4, 6, and 8 light cluster sets. Many thousand are in constant use in one of the most important London areas.

HEATING.

The outstanding success of the Welsbach "Handiheater" becomes greater each year, and its popularity is still on the increase. This season the usual 5 and 7 tube sizes in black will be continued, and also the 5-tube in aluminium.

The "Handiheater-de-Luxe," which is made with 5 and 7 tubes, will again be prominent. This highly attractive cast iron gas fire is fitted with the Kern burner.



"Handiheater-de-Luxe" in cast iron, specially designed for Gas Undertakings.

The number of patterns of the Welsbach-Kern radiators this year will be reduced to four, to obviate complicated stock. The selected patterns will be two 5-tube and two 10-tube radiators, and will include the well-known "O.B." with frieze and trivet, and the newer model known as the "Kirby." These patterns have outstripped in sales and popularity the other 5-tube radiators, and there is every indication of their fully meeting the demand for the smaller size. The 1.P. and 1.V. 10-tube radiators will also be available. Either pattern can be supplied with side boiling ring, a distinct advantage over the old type of top boiling ring. All Welsbach-Kern radiators are stocked in art black and enamelled colours.

A new model, designed to meet a cheaper class of trade, is the "Venus" gas fire.

Messrs. Lighting Trades are continuing their "Glasmi" 5 and 7 tube gas fires.

A NOTABLE JUBILEE.

It is realized nowadays that there is nothing unique in the achievement of fifty years of business life, but Messrs. Hans Renold, Ltd., of Burnage Works, Didsbury, Manchester, have every reason in being justly proud of the Company's development, in the lifetime of Mr. Hans Renold, from a small Salford cellar to the world-wide organization now controlled from Burnage. To mark the occasion, the Company have published a most attractive Jubilee Brochure entitled "The Story of Hans Renold, Ltd.—Chainmakers, 1879-1929." The booklet opens with a portrait and short biography of the founder himself, who was born in Aarau, Switzerland, in 1852. After being engaged in engineering work in Paris, he came to England in 1873, and six years later bought the business in Salford, which was the foundation of the Renold organization. In 1881, Hans Renold became a naturalized British subject, and has since been made a magistrate of the City of Manchester. The Brochure goes on to deal with the growth and development of the Company from its earliest days, when the chains then manufactured were balance, monkey, and common roller chains. When Hans Renold took over the business, he continued to manufacture these chains, which were used for textile machinery; but it was the introduction of the "safety" bicycle in Great Britain that gave the real start to the chain business. In considering the development from the earliest days, when Hans Renold commenced with a man and a boy, to the present day when the Company employs 2250 people, it is always necessary to remember that not only has the problem been to find markets, but also to obtain machinery to enable the goods to be produced, and, apart from his achievement in the chain world, one of Hans Renold's greatest efforts has been in the provision of the necessary special and delicate tools required to enable him to manufacture his product. This year Hans Renold attains his seventy-seventh birthday, and all who have had the privilege of being associated with him will extend their heartiest congratulations on the attainment of the jubilee of his firm and wish him long life and good health.

Firedamp and Frictional Sparking.

In a number of firedamp explosions there have been suggestions that frictional sparking or heating may have caused the ignition. In earlier research work, however, it proved exceedingly difficult, if not impossible, to ignite firedamp by friction, and frictional sparking occurs so often in practice without ill results that it has not been generally regarded as a serious danger. Some modification of this view seems necessary, having regard to the results of recent work carried out by the Safety in Mines Research Board. In a paper by M. J. Burgess and R. V. Wheeler published last year (S.M.R.B. Paper 46) it was shown that the heat generated by the impact of rock against rock might be sufficient, under certain limited conditions, to ignite firedamp. The experiments were continued with a view to determining whether the heat of impact of metal against rock can ignite firedamp. Experiments of this nature could not be carried out in a mine, but, after a number of laboratory tests, such as the abrasion of steel by a revolving carborundum wheel, full-scale tests were made with an ordinary chain coal-cutting machine working against a built-up mass of rock in explosive atmospheres. In these tests it was found that, with certain kinds of rock, firedamp could be readily ignited, though it is not certain whether the ignition was by the sparks emitted or by the heating of the rock surfaces caused by the impact of the coal-cutter picks. An account of this work has just been published in another paper by the same authors entitled "The Ignition of Firedamp by the Heat of Impact of Metal against Rock." (Safety in Mines Research Board Paper No. 54; H.M. Stationery Office, price 6d. net.)

Coke Oven Managers' Year Book.

We have received from the Council of the Coke Oven Managers' Association a copy of their Year Book for 1929, which book is printed for private circulation only. A glance over the pages is sufficient to demonstrate the great value of the work done by the Association, whose transactions are included, while the volume also contains a great amount of statistical information that must be of the greatest use to all concerned in this important industry. The preface, which is signed by the President, Mr. G. A. Hebden, and the Hon. General Secretary, Mr. T. Westthorp, states that the Association continues to expand numerically, while its sphere of activity has greatly increased during the past year. We feel certain that in neither direction will a limit be reached for a long time yet to come.

RAPID METHOD FOR THE DETERMINATION OF NITROGEN IN COAL.

By J. W. WHITAKER, Department of Mining and Fuels, University College, Nottingham.

From "Fuel in Science and Practice."

The standard Kjeldahl method for the estimation of nitrogen in coal is tedious and somewhat liable to error because of (1) unsatisfactory conversion of the nitrogen to ammonia and (2) unreliability in the end point of the final back titration. The following modification, in which the coal is rapidly oxidized with strong sulphuric acid and potassium permanganate, is recommended as being more expeditious and accurate. The ammonia is estimated by Nesslerizing.

Place 0·100 gramme of the finely powdered sample, passing a 60-mesh sieve, in a dry 100 c.c. conical flask of good glass, cover it with 15 c.c. of concentrated sulphuric acid, and add 1 gramme of potassium permanganate crystals at the rate of about 0·1 gramme per min. Shake well after each addition. The temperature will rise to 60° of 70° C., and then fall a little during the addition of the last portions of the permanganate. If the permanganate be added too rapidly, a small but generally harmless explosion will occur. After 10 min. heat the flask and contents over a gentle flame either in the fume cupboard or preferably on the laboratory bench in order to have the operation under good control. If the latter alternative be adopted, cover the flask with a small watch-glass. Bring the liquid to the boil, and boil until the solution clears. This requires about 3 or 4 min. for bituminous coals, but longer for anthracites. Allow to cool somewhat, transfer to a 1½-litre flask containing 300 to 500 c.c. of cold tap water, add 40 grammes of caustic soda in stick form, immediately connect up to a steam supply and condenser, and steam distil in the usual manner. Collect the condensate in about 100 c.c. of cold distilled water to which, as an additional precaution, two drops of strong sulphuric acid have first been added. Continue the distillation until 300 or 400 c.c. have been collected. Cool the condensate if necessary, and make up the volume to 500 c.c., or any definite value, with distilled water. Mix thoroughly, and estimate the ammonia in 50 c.c. of the liquid by Nesslerizing. (For details see any standard work on Analytical Chemistry, or "Water Analysis," by Wanklyn, p. 48.) The nitrogen is, of course, 14/17 of the quantity of ammonia found. The Nessler solutions require a few hours for their preparation, but once they are made the actual nitrogen determination may be done in about 1 hour—e.g., 0·100 gramme coal taken, 450 c.c. of condensate obtained, and 50 c.c. of this required, in the Nessler test. 17 c.c. of the standard ammonium chloride solution *plus* 33 c.c. of distilled water to make up a volume of 50 c.c. The ammonium chloride solution contains $1\frac{1}{50}$ m.gramme of NH_3 per c.c. It is made from a stock solution of 3·15 grammes of ammonium chloride per 1000 c.c. by diluting 10 c.c. of the latter to 1000 c.c. with distilled water. Thus, the nitrogen present is

$$\frac{17}{100} \times \frac{450}{50} \times \frac{14}{17}$$

= 1·26 p.ct. With a little practice in Nesslerizing one can estimate the percentage of nitrogen to within 0·03 or 0·04.

Traces of ammonia fumes should not be present in the room during the experiment. A blank test on the water and reagents should be carried out to ensure their purity and also to verify the absence of ammonia fumes. A few typical results are given:

—	Kjeldahl-Wilfarth-Gunning* Method.	New Method.
Coal A	1·25, 1·31, 1·35	1·28, 1·30, 1·30
,, B	1·45, 1·40, 1·38	1·40, 1·44, 1·42
Anthracite	0·92, 0·91, 0·97	0·93, 0·96, 0·97

* Baranov and Mott ("Fuel," 1924, 3, 31, 49) have shown that the Kjeldahl-Wilfarth-Gunning method, in which potassium sulphate and mercuric oxide are used with the sulphuric acid, gives results which are more accurate than those of any other usual modification of the Kjeldahl method. The Fuel Research Board have recommended the Kjeldahl-Wilfarth-Gunning method in preference to other earlier modifications, but the new method here described appears to have advantages.

SIMPLIFIED IODINE PENTOXIDE APPARATUS FOR DETERMINATION OF CARBON MONOXIDE IN FLUE GAS.[1]

By F. E. VANDAVEER and R. C. GREGG, American Gas Association Testing Laboratory, Cleveland, Ohio.

Paper before the Division of Gas and Fuel Chemistry of the American Chemical Society.

During the past three years there has been developed at the Testing Laboratory of the American Gas Association, in co-operation with the U.S. Bureau of Standards, an iodine pentoxide apparatus which retains a high degree of accuracy, is comparatively simple to operate, and permits rapidity of determination. A complete analysis with an accuracy of 0·002 p.ct. may usually be made in about 20 mins. With this simplified apparatus one chemist can operate two to three instruments and make as many as fifty determinations per day.

Iodine pentoxide has been used for determining concentrations of carbon monoxide for many years. The reaction was described by Ditte (9)* in 1870, and its first use for the detection of carbon monoxide was by La Harfe and Reverdin (8) in 1888, and by Gautier (11) in 1890. From the last date until the war few publications have treated this subject, but since 1914 a great deal of material resulting from research has been published. A bibliography of articles dealing with the subject is given at the end of this paper.

APPARATUS USED BY VARIOUS INVESTIGATORS.

Many of the methods and apparatus used heretofore have been developed for certain particular problems and differ essentially in the system used for purifying the gas before passing through the iodine pentoxide, the temperature to which the iodine pentoxide is heated, the manner of purging the system, and the method of determining the amount of carbon monoxide present.

Probably the apparatus most widely known in America previous to the development of the present one is that described by Berry and co-workers (2) of the U.S. Bureau of Standards. Chromic acid heated to 100° C., sodium hydroxide (liquid), concentrated sulphuric acid, sodium hydroxide (solid), and phosphorus pentoxide, used in the order mentioned, constituted the purification system. The iodine pentoxide was heated to a temperature of 155° C. by means of an oil bath. Air obtained from the room for purging the system was passed through concentrated sulphuric acid, activated charcoal, and a mercury trap. The amount of carbon monoxide in the sample was determined by collecting the iodine liberated in potassium iodide and subsequent titration with sodium thiosulphate.

Another apparatus, described by Burrell, Seibert, and Jones (4), of the Bureau of Mines, has been used considerably. The one designed by the Bureau of Standards is used primarily for determining concentrations of carbon monoxide in the products of combustion from gas appliances, that of the Bureau of Mines for determining the amounts of carbon monoxide in any usual mixture of gases in which it may be present. As a purifying system, concentrated sulphuric acid, lead acetate, barium hydroxide, concentrated sulphuric acid, fuming sulphuric acid, concentrated sulphuric acid, potassium hydroxide, and sulphuric acid are used in the order named. The iodine pentoxide tube is electrically heated to 150° C. by means of a wire-wound jacket. For purging the system, air is taken from the room and passed through potassium hydroxide solution and soda lime. Instead of collecting the iodine liberated, the carbon dioxide produced is absorbed by a standard solution of barium hydroxide and the excess is titrated with an oxalic acid solution. Both the apparatus of the Bureau of Standards and that of the Bureau of Mines are capable of giving accurate results, but are cumbersome to manipulate, require a long time and a large amount of gas for purging, and are somewhat difficult to keep in good operating condition.

For determining concentrations of carbon monoxide in motor exhaust gas, Teague (23), on account of the gasoline vapour and heavy unsaturated hydrocarbons present which reacted with iodine pentoxide, devised another type of apparatus. The

* Numbers in parentheses refer to literature cited at end of article.

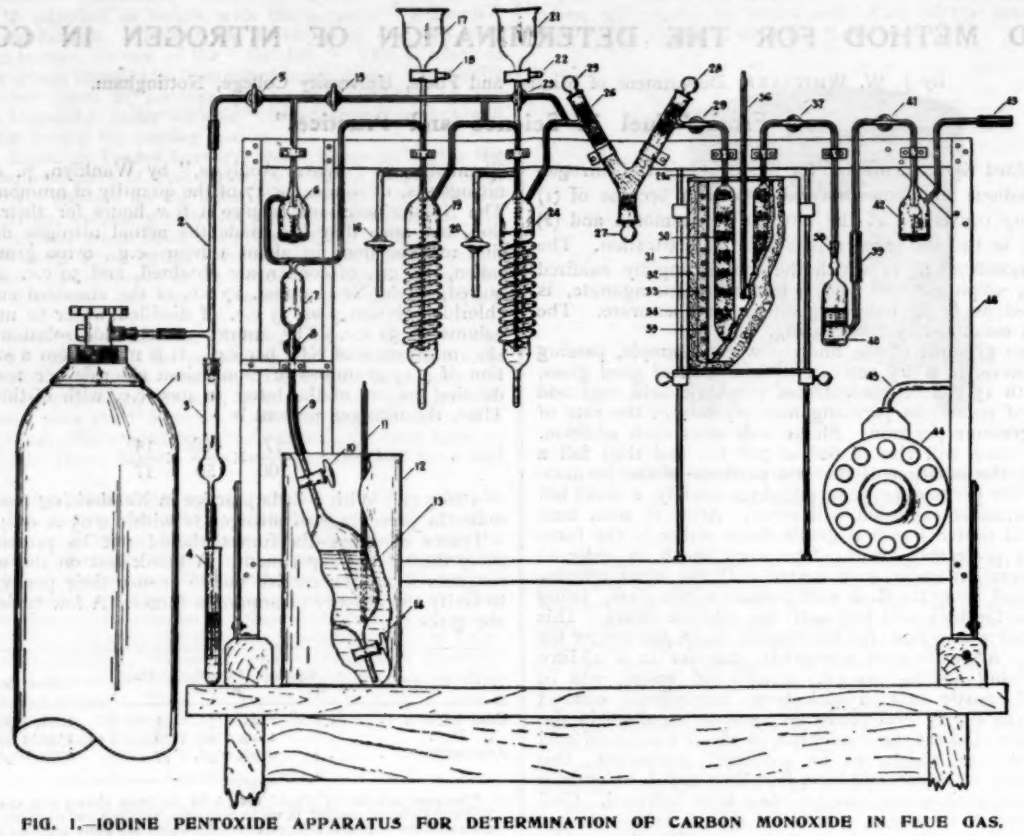


FIG. 1.—IODINE PENTOXIDE APPARATUS FOR DETERMINATION OF CARBON MONOXIDE IN FLUE GAS.

purification system consisted only of liquid air, which condensed the carbon dioxide, water vapour, unsaturated hydrocarbon vapours, and gasoline vapours. A **U**-tube of iodine pentoxide was heated to 150° C. by means of an oil bath, and iodine liberated by carbon monoxide was absorbed in potassium iodide and titrated with 0·001 *N* sodium thiosulphate. Such a system may give accurate and reliable results under nearly any condition. Liquid air, however, is not readily available in every section of the country, and its general use in such an apparatus is not always possible. Precaution must be taken to see that the gases, after leaving the liquid air, are brought back to room temperature before entering the iodine pentoxide; otherwise they may cool the iodine pentoxide to such an extent that no reaction with carbon monoxide will take place.

In England, two very thorough investigations of the use of iodine pentoxide have been made by Davies and Hartley ([6], [7]) and by Wood and Howarth ([25], [26], [27]). As a result of their investigations, Davies and Hartley use anhydrous calcium chloride, two **U**-tubes of calcium chloride, and phosphorus pentoxide in the purification system when making determinations for carbon monoxide in the products of combustion from coal gas flames. The iodine pentoxide is heated to 125° C. in a gas oven. Air for purging the apparatus is purified by passing it through a separate system consisting of anhydrous calcium chloride, phosphorus pentoxide, iodine pentoxide heated to 125° C. in a gas oven, potassium iodide, potassium hydroxide solution, and soda lime. The amount of iodine collected in potassium iodide is titrated with sodium thiosulphate beyond the end point and back-titrated with 0·001 *N* iodine solution.

The apparatus designed by Wood and Howarth is quite similar to that of Davies and Hartley, the reagents in their purification system consisting of calcium chloride, potassium hydroxide, calcium chloride, and phosphorous pentoxide. Recently they have included a tube of liquid air. Iodine pentoxide is heated to 120° C. by means of an electric air bath. For purging the apparatus, air is passed through a separate iodine pentoxide system which includes calcium chloride, phosphorus pentoxide, iodine pentoxide at 120° C., potassium iodide, and potassium hydroxide, in the order mentioned. Titration of the iodine is made with 0·05 *N* sodium thiosulphate.

Neither of these systems has provision for removing aldehydes or unsaturated hydrocarbon, except when liquid air is used, and the use of a separate iodine pentoxide apparatus for purification of the purge gas tends towards slow manipulation.

DEVELOPMENT OF "A.G.A." APPARATUS.

When the American Gas Association's Testing Laboratory began operations, it became necessary to develop an iodine pentoxide apparatus to determine rapidly concentrations of carbon monoxide in products of combustion with an accuracy of at least 0·002 p.ct. Some of the apparatus already in use, though sufficiently accurate, had the disadvantage of being slow and cumbersome to manipulate. This was caused primarily by the number of purifying materials used and the method of obtaining carbon monoxide-free air for purging. The Bureau of Standards constructed the first apparatus for the laboratory, which has formed the basis for the development of the present model.

Purifying System.—Since all determinations were to be made on flue gases, it was possible to simplify the purifying system considerably. The flue products to be analyzed were in all cases from the combustion of gas which contained practically no hydrogen sulphide. Therefore, lead acetate could be eliminated. Absorption of carbon dioxide from the sample by means of barium hydroxide and potassium hydroxide was unnecessary, as the amount of carbon monoxide in the sample was to be determined by titrating the amount of iodine liberated in the reaction:

$$5CO + I_2O_5 = 5CO_2 + I_2$$

The small amount of carbon dioxide in the sample which might be absorbed in the potassium iodide solution did not affect the titration of the iodine with sodium thiosulphate. It was decided to titrate the iodine instead of the carbon dioxide, for the following reasons: (1) It would then be unnecessary to remove carbon dioxide completely from the sample; (2) it is difficult to absorb all the carbon dioxide, and the use of barium hydroxide solutions weaker than 0·02 normal is undesirable; (3) a more distinct end point may be obtained with iodine and 0·001 *N* thiosulphate using a starch indicator. Consequently, the removal of sulphur dioxide and carbon dioxide being unnecessary, barium hydroxide and potassium or sodium hydroxide solutions were omitted. The function of the purifying-train would then be to remove water vapour, unsaturated hydrocarbons, and aldehydes. Since heavy hydrocarbons and gasoline vapours are not usually present in flue gas, it was unnecessary to use liquid air. Oxides of nitrogen, if present at all, are not sufficiently concentrated to affect the iodine pentoxide, as will be shown later.

For the removal of unsaturated hydrocarbons, aldehydes, and some water vapour, two scrubbing towers of chromic acid (made by saturating concentrated sulphuric acid with potassium dichromate) were used. In the beginning of the investigation the first chromic acid tower was heated to 100° C., but a series of experiments indicated that very little difference was noted if this tower was heated or maintained at room temperature. As a result both chromic acid towers are maintained at room temperature. To remove any acid spray and some carbon dioxide, a small amount of solid potassium hydroxide was placed at the top of the **V**-tube 26 (fig. 1) and the remainder of the tube was filled with phosphorus pentoxide, which served completely to dry the gas before it entered the iodine pentoxide tube.

Iodine Pentoxide.—The tube of iodine pentoxide is main-

tained at 150° C. At this temperature the reaction with carbon monoxide is rapid and complete. There is also the added advantage of a higher temperature to keep the iodine liberated from condensing on the walls of the capillary tubing leading from the **U**-tube to the Gomberg bulb. An electric air bath is used to heat the iodine pentoxide, the temperature of the bath being controlled manually by means of a rheostat in series with a resistance coil. Iodine pentoxide of high purity which has been found most satisfactory for this type of analysis is known as iodic acid anhydride (Merck).

Pure iodine pentoxide does not decompose below 260° C., but the commercial grade usually contains lower oxides of iodine, iodic acid, and possibly other compounds, which decompose readily below this temperature. In order to prepare iodine pentoxide for use in analyzing for carbon monoxide, it is necessary to maintain it at a temperature of 205°-215° C. for about 2 days while air or nitrogen is being drawn through it at the usual rate. At this temperature all the unstable compounds are decomposed and removed from the system. The temperature is next dropped to about 150° C. and purging continued for about two days more, when the iodine pentoxide will usually be ready for use. No trace of iodine should be detected when starch is added to the potassium iodide solution after two or three hours' purging with nitrogen. Once the iodine pentoxide is properly conditioned, it will give satisfactory operation for about six months when the apparatus is operated daily. Each day a blank may be obtained in about 15 min.

Nitrogen Used for Purging System.—For purging the apparatus and also to carry out of the iodine pentoxide tube all the liberated iodine, a gas absolutely free from carbon monoxide must be used. Air from a room where any fuel is burning, or that prevailing in most industrial districts, contains some carbon monoxide. Consequently, if air is used for purging, some means of removing all carbon monoxide must be employed. An apparatus accomplishing this purpose would be practically a duplicate of the equipment used for the test, and therefore would entail cumbersome manipulation and an unnecessary loss of time. In order to eliminate an added purification system, commercial nitrogen purchased in cylinders has been successfully used for over two years. Nitrogen as made by the liquefaction processes is not only free from carbon monoxide but is inert and does not react with iodine pentoxide.

Description of Iodine Pentoxide Apparatus.

The complete apparatus including the arrangement for purging with nitrogen is shown in fig. 1. The sample is being drawn through the apparatus from the sample bottle 13 by means of a vacuum system attached to capillary tube 45. The sample passes successively through tube 7, chromic acid tower 19, chromic acid tower 24, **V**-tube 26, iodine pentoxide tube 30, Gomburg bulb 40 containing potassium iodide, and mercury seal 42 into the vacuum line attached to capillary tube 45. While the sample is passing through the apparatus the nitrogen is overflowing through tube 4, since gas cock 5 is closed. After the sample has been taken into the apparatus, gas cock 8 is closed and gas cock 5 is opened, so that nitrogen passes down through mercury seal 6 and then through the system in the same manner as the sample. The flow of nitrogen is regulated so that there is a slight overflow through 4.

Sample bottle 13 is made of glass and has a capacity of approximately 500 cc. The exact volume of the bottle is carefully determined and, by correcting the volume of gas it contains for temperature and pressure (atmospheric), the volume is reduced to standard conditions.

An electrically-heated air bath 31 is used to heat the iodine pentoxide tube. This bath consists of two brass boxes 31 and 35. A 60-ft. coil 34, of 22-gauge (B. & S.) chromel A wire, is wound on the insulation of the inside box. The coil is fixed by asbestos cement baked in place. The remainder of the space 32 is filled with asbestos fibre insulation, and an asbestos board 29*a* is used to cover the top of the furnace. The temperature of the bath is manually controlled by a 100-ohm, 1·5-ampere circular rheostat 44 in series with the coil.

The chromic acid towers are filled through funnels 17 and 21. They may be emptied by attaching a suction flask to the glass tubes on which gas cocks 16 and 20 are located.

Beginning at the left, **V**-tube 26 contains at its top a layer of glass wool, below which is a layer of solid potassium hydroxide and next a layer of glass wool, the remainder of the tube being filled with phosphorus pentoxide. Stopcocks 25, 27, and 28 are sealed in place with paraffin.

In the **U**-tube 30 there are 1·3 cm. alternate layers of glass wool and iodine pentoxide. The Gomberg bulb 40 has three compartments containing potassium iodide which provide ample scrubbing surface to absorb all the iodine which may be liberated. The frame 46 supporting the glass is made of 1-in. angle iron. *(To be concluded.)*

CEMENT COVERING FOR SERVICE PIPE.

Practice of New Orleans Company shows Long-Time Economy.

By A. E. Merchant, General Superintendent, Gas Department, New Orleans Public Services, Inc.

[From the "American Gas Journal."]

Prior to 1901, the gas services in New Orleans were lead, laid in grooved cypress lumber in order to make them sufficiently rigid to hold the grade. This type of service is practically everlasting. In the early part of the year 1901, Mr. Bankson Taylor took charge of the Gas Company here and changed the type of services to black pipe coated with tar, claiming that lead laid in grooved cypress was too expensive. This coating was done in the yard at the gas plant by dipping, and after the service was laid, the bare parts at the joints were painted with a plastic tar at atmospheric temperature.

In the early part of 1903, Mr. Thomas D. Miller became Manager of the gas property. At about that time, the tar covered services started giving trouble by rusting out, so during the middle of 1903, Mr. Miller, at the suggestion of Mr. H. Palm, who is now Superintendent of the Mains and Service Department of the New Orleans Public Service, Inc., began experimenting with black iron services laid in Portland cement. The early experiments with these cement covered services showed that they could be laid at a reasonable cost, and observations of other underground iron laid in cement indicated a much longer, if not permanent, life. The tar covered services continued giving trouble and in increasing numbers, so, in September of 1904, the type of services were changed to black iron laid in cement, and this type of service has been continued to the present writing.

Good Results Obtained.

Exceedingly good results have been obtained from this service. Where the cement coating was done properly, services were found in perfect condition after twenty-five years in the ground. Obviously a great deal of care must be exercised to be sure that the pipe is properly covered at all places. There have been some service leaks, and invariably it was found that the cement coating was not done properly, or that some other company, in running an underground line across the service, had broken the concrete from the service. It was also found from long experience with gas services that, practically speaking, galvanized pipe is no better than plain black pipe which is used exclusively in cement covered services. Of course, galvanized pipe is used exclusively when the pipe is above ground, such as risers. The soil in the majority of places in the city is slightly alkali, and it seems that shortly after a plain black iron or galvanized iron pipe is placed in the ground, galvanic action sets in and eats the pipe out very fast. The cement coating, however, seems to resist absolutely both galvanic action and soil corrosion.

Electrolysis Data.

Most cities have trouble from electrolysis and New Orleans is no exception, though they have apparently had very little trouble from this source. They are just beginning to get some real data on the effect of electrolysis on cement covered services. Just recently they had occasion to remove some services from two to four years old in a rather high current area. They examined these services very carefully where they passed over water mains or other objects to or from which one might expect a flow of current. On the services examined absolutely no effect from electrolysis was found. On one service they found no effect where it passed over a water main, but about 15 ft. away the service was eaten about half-way through. It was evident, however, that there was a bad cement job at this point; in fact, apparently cement had never even touched this part of the service. These services were not in the ground for a sufficient length of time to be of any real value. However, they are worth noting. But it is known by actual inspection of the old services which they have had occasion to remove that the metal of the pipe has been found to be in perfect condition after fifteen to twenty years of service, except, of course, where the pipe is found to be corroded from bad workmanship in the laying of the cement around the pipe. They are now beginning an investigation of these cement covered services which have been in the ground for long periods and are located in parts of the city where they know a very bad electrolysis condition

exists. Through this investigation, they hope to determine the value of cement coatings to withstand bad electrolysis conditions.

METHOD OF LAYING SERVICES.

The first step, of course, in laying a service is to expose the main. The main is then tapped about 4 in. to one side of where they want the service to run. This hole is tapped with a Mueller combination drilling and tapping machine. The smallest size service laid at present is 1½ in. They, of course, lay larger size services as the customer's demand and length of service may require. Described here is the laying of a 1½-in. service.

As soon as the service tap is completed and the machine is removed, a street tee with rubber stopper in the top and extending below the side outlet, is tightly screwed into the main with the side outlet parallel to the main and pointing toward the centre of the trench. During the tapping of the main the other members of the service gang complete the trench from the main to where the riser is to be placed. They are now ready to begin with the service proper.

A street ell is now screwed tightly into the street tee, so that the outlet points directly down the centre of the trench towards where the riser is to come out of the ground. The boxing or cement form is now laid along the middle of the trench. This form consists of a trough made of a 1-in. by 3½-in. pine bottom, to which is tacked ½-in. by 4-in. sides. They now screw the 1½-in. black iron service pipe into the street ell, and line the form up so that the pipe will lie in the centre. All the services are laid so that they will drain back into the main. So, when the trench is dug it is sloped upward from the main to the riser. When the cement form and pipe are all ready, the pipe is raised, and about 1½ in. of fairly soft mix of 1 to 3 Portland cement and sand is placed all along the bottom of the form. The pipe is now lowered and pressed down into the cement to a distance of about ¾ in. from the top of the form to the top of the pipe. This insures a good ¾ in. of cement on top and at the bottom of the service, and 1 in. on both sides. The 1 to 3 mix of fairly soft cement and sand is then poured on top of the service and tamped on both sides of the pipe with a trowel to insure a good job. After it is well tamped, it is smoothed off on top with a trowel and a strip of pine ½ in. and 4 in. laid on top.

The riser is now placed and capped, ready for the meter department to set the customer's meter. The riser is similarly protected with cement and boxing up to and a little above the ground level. After the riser is completed, they go back to the street tee, remove the rubber stopper, and plug the top opening. The street tee and street ell are covered with cement mortar and short strips of ½-in. by 4-in. pine placed on top and sides. These strips just mentioned and the strip all along the top of the service protect the cement during backfilling. The service is now complete and ready for backfilling.

All screw joints in the service from the street tee and main to the service riser are doped with Key paste to insure a non-leaking joint.

The average service gang consists of three labourers, a pipe-fitter helper, and service foreman who is a pipe-fitter, and assists in the pipe-fitting work. It is found from accurate data that the additional cost of a 1½-in. service due to adding the cement coating, will run to about $0·082 per lineal foot on an average. When larger services, such as 2-in., 3-in., or 4-in., are laid, they box them in concrete in the same manner as described above, using larger cement forms. The cost of these larger services will, of course, run higher in proportion to the amount of cement used.

A REAL INDUSTRIAL GAS CUSTOMER.

Meadows Manufacturing Company Puts Gas to a Great Variety of Uses in its Plant.

By E. E. PIERSON.

[From the "American Gas Journal."]

The recent installation of a 15-ton gas-fired furnace for heat treating gray iron castings in the foundry of the Meadows Manufacturing Company, at Bloomington, Illinois, adds another use for gas to the already numerous applications of this fuel in the Meadows plant.

The installation of this furnace was necessitated due to the fact that this Company had started production on a new washing machine which contained a considerable number of gray iron castings. Since very rigid requirements as to machining and drilling had to be met in the machine shop, it was of the utmost importance that the castings be in such condition as to eliminate any possibility of warping and misalignments after machining.

The operation of heat treatment, of course, removes any internal stresses and strains in the iron, caused by rapid cooling in the moulds, and is carried out at a temperature considerably under the critical temperature, thereby involving no structural change in the metal. Further, the necessity for aging over long periods of time is obviated. On an operation of this nature, it is of special importance that the heating be uniform throughout, and the rate of temperature rise and soaking period be accurately controlled to follow a pre-determined cycle which varies according to the nature of the charge.

Both oil and gas were considered as fuels for this operation, but, after careful analysis of all the factors involved, the decision was reached to utilize gas. The fact that gas had proved superior to other fuels for other of the Company's uses, was, no doubt, partly responsible for the selection by the management.

On operating this furnace the castings are subjected to a temperature of 1000° Fahr. for three hours, whereupon the gas is turned off and the metal allowed to cool to 300°-400° in about six hours.

FURNACE CONSTRUCTION.

The inside dimensions of the furnace are 6 ft. in width and 9½ ft. in length, with a height of 5½ ft. The walls are of 9-in. fire brick. The swinging doors have 4-in. channel frames and a sheet-iron casing on the outside, all filled with insulating concrete rammed into position and supported by reinforcements, giving a serviceable door, much lighter than fire brick. Surface combustion, high-pressure burner equipment is used, four burners on each side, firing over the arch.

The castings are placed in containers, 30 in. wide, 36 in. long, and 18 in. deep, which rest upon supports 9 in. high and open at the ends, the sides being closed. A double row of these supports and containers is used. Two ducts are thus formed by the support, each leading to flue openings at the bottom of the rear wall. Holes were cut in the top of the supports which compose the bottom of the containers, and the front ends of the ducts are sealed with fire brick. This arrangement forces the flue gases to pass down through the metal parts and out through the ducts to the flues. Very uniform heating of the castings is obtained by this method.

The following data after several weeks of operation obtained:

Weight of castings	6871 lbs.
Weight of supports	1170 ,,
Gross charge	8041 ,,
Time heating to 1000° Fahr.	3 hours
,, holding at 1000° Fahr.	9 ,,
,, cooling to 400° Fahr.	3 ,,
Gas consumption	6800 c.ft.
Gas per lb. of product	0·989 c.ft.
Kind of gas	Carburetted water gas
Calorific value of gas per c.ft.	565 B.Th.U.

Westminster Technical Institute.—The Prospectus of Technical Classes to be held at the Westminster Technical Institute, Vincent Square, S.W. 1, during 1929-30 has been published. For the Scheme of the Institution of Gas Engineers, arranged in conjunction with the Board of Education, an approved standard of preliminary education is necessary. The "grouped" courses of study in Gas Engineering and Gas Supply at the Institute provide complete preparation for the Ordinary, Higher, and Diploma Examinations. The scheme of the City and Guilds of London Institute comprises examinations in Gas Supply Practice, Gas-Works Practice, and Gas Fitting; and adequate provision is made for "grouped" courses of study in these subjects. The laboratories are equipped with the most modern appliances and apparatus, and make ample provision for the experimental and practical work required by students preparing for the various examinations. The session 1929-30 will commence on Monday, Sept. 23. The Principal, Mr. J. Stuart Ker, B.Sc., will be pleased to forward to intending students and others interested in the work of the Institute copies of the Prospectus, containing full particulars of the courses of instruction, syllabuses of work, and fees. Intending students should attend at the Institute during the week commencing Sept. 16 to obtain expert advice regarding the courses of study suited to their individual requirements.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Development of Gas Sales.

SIR,—The paper given before the Irish Association of Gas Managers by Mr. W. H. Ainsworth has aroused considerable interest, and is particularly interesting to the smaller undertakings threatened with state-aided competition.

Everybody will be in agreement with the necessity for advertising to the fullest extent possible, and some of the suggestions put forward by Mr. Ainsworth are excellent. Considerable enlightenment also arises from the discussion which followed, and if I may be allowed to add to the remarks on this subject, may I suggest the following?

A maintenance staff of courteous fitters interested in their work and the company or department they serve, is a necessity nowadays to every gas undertaking, large or small. Neglected burners giving a poor light provide a good opening for the electricity canvasser. The customers do not blame the fittings, but put it down to "bad gas." The difficulty which confronts many gas managers and handicaps them in this respect is that many local authorities and even boards of directors insist upon co-operation with the plumbers and ironmongers, which, in my opinion, is altogether one-sided.

It has been a subject for considerable controversy, but resolves itself into a plain question, "Is this co-operation likely to be to the advantage of the gas undertaking?" Can we be assured that the plumber (who is their indirect representative) will invariably show courtesy and tact to their customers; will he recommend the most suitable fittings, and do his utmost to push gas to the best advantage? Are we safe in regarding the plumber and the ironmonger as representatives in the best sense of the term? If not, the co-operation is not worth a second's consideration.

There is another point which might have been thought to be outside this discussion—*i.e.*, is gas now considered fashionable? I am rather afraid that many people are inclined to instal electric light, not because they think it better, but because it is considered the fashionable thing to do. It is generally agreed that there is no fuel like gas; but I am one of those people who regard the lighting load as the life blood of the industry, which is, I believe, a term used by Mr. H. E. Bloor, of York, and reiterated by Mr. W. J. Gray, at Dublin recently. It is an admitted fact that the best lighted streets in this country are lighted by gas, and this was splendidly illustrated in your issue of Aug. 7, wherein you demonstrate a sample of gas lighting at Scarborough. Gaslight is admitted to be better for the eyesight, and with modern fittings there should be no doubt about the industry holding its own for lighting against our competitor. The switch lights are not expensive, and if they were better known would, I am sure, in many cases be adopted in preference to electric light. People are not all enamoured merely of the cheapness of the product, but if it can be shown that gas is fashionable it is a greater attraction than mere cheapness. Can we, therefore, make gas fashionable in the strict sense of the word?

Some five years ago, if a boot and shoe manufacturer had said that in 1928 his industry would be using over a million reptile skins in its products, he would have been regarded as a lunatic. The fact is that some people made the desire for these skins in footware fashionable, and to-day they are seen everywhere. The analogy is perhaps far fetched, but if it is possible to get local authorities, architects, builders, and others to regard gas as a fashionable thing, we shall not hear of houses being put up and an embargo placed upon gas fittings.

Another point occurs to me as being worthy of consideration, and that is the question as to whether the full value is being obtained from what apparatus is in the houses. If an inventory is made as to the fittings in each house, not only those supplied by the gas undertakings, but what the customers have purchased themselves, and a check made after each meter reading as to the quantity consumed, it might be found that certain of this apparatus is not in use through some fault which may not have been reported. This, if rectified, would probably be put into use again by the customer, thus obtaining an increased consumption.

I recollect an instance where a visit by a manager to a house showed that where they had several lights, a cooker, a boiler, and two gas fires, one of the gas fires and the boiler had been out of action some time, and after being rectified were put into regular service again. There may be many instances of this kind.

These are a few points that occurred to me after a most interesting meeting, and I sincerely hope our friends in Ireland will find that the Shannon Electricity Scheme, which has been a bogie for so long, is not such a menace to the gas industry as anticipated. It has been a means of arousing that determined spirit as expressed by Mr. H. W. Saville, of Wexford, to prove that the older industry is still in the forefront.

D. ALBERT PRATT.

73, *Holgate Road, York.*
Sept. 3, 1929.

MISCELLANEOUS NEWS.

MANCHESTER'S CHIEF GAS ENGINEER.

Recommendation Referred Back to Committee.

At a meeting of the Manchester City Council on Wednesday last, the minutes of the General Purposes Committee contained a resolution referring back to the further consideration of the Gas Committee a recommendation that Mr. A. L. Holton should be appointed Chief Gas Engineer at a salary of £1750 a year (see "JOURNAL" for July 24, p. 184).

Mr. George Hall moved as an amendment that the recommendation of the Gas Committee should be adopted. If the Council, he argued, were not satisfied with the Gas Committee, they ought to ask for its resignation, but it was time they realized that the discussion in the Council of the interests of one of the most important Departments of the Corporation should cease.

The amendment was lost, and the reference back approved

GAS UNDERTAKINGS ACT ORDERS.

SECTION 6.

Carlisle Corporation.

The Corporation shall, from April 1, 1930, charge according to the number of B.Th.U. supplied, and shall on or before Jan. 1 give notice of the calorific value of the gas they intend to supply.

Dunbar Corporation.

The Corporation shall, from Feb. 2, 1930, charge according to the number of B.Th.U. supplied, and shall on or before Nov. 2 give notice of the calorific value of the gas they intend to supply.

Newport (Fife) Corporation.

The Corporation shall, from April 1, 1930, charge according to the number of B.Th.U. supplied, and shall on or before Jan. 1 give notice of the calorific value of the gas they intend to supply.

St. Ives (Hunts.) Gas Company, Ltd.

The Company shall, from Jan. 1, 1930, charge according to the number of British thermal units supplied, and shall, on or before Oct. 1, give notice of the calorific value of the gas which they intend to supply.

Worcester New Gas Light Company.

The Company shall, from April 1, 1930, charge according to the number of B.Th.U. supplied, and shall on or before Jan. 1 give notice of the calorific value of the gas they intend to supply.

DECLARATIONS OF CALORIFIC VALUE.

Elsecar, Wentworth, and Hoyland Gas Company.—500 B.Th.U. (Jan. 1, 1930.)

Whitby Gas Company.—450 B.Th.U. (Jan. 1, 1930.)

GAS METER TESTING IN GLASGOW.

The report of the City of Glasgow Inspector (Mr. S. B. Langlands) on the work of the Gas Meter Testing Department for the year ended May 31, shows that the total number of meters tested during the year was 32,190, and the amount of fees collected was £1917. These figures are an increase on those of 1928. Of the total number of meters tested, 7957 were new meters, 23,783 were repaired meters, and 450 were sent in by gas consumers for certification as to correctness. Below is a summary of the results of testing.

SUMMARY OF RESULTS OF TESTING.

New Meters.		Repaired Meters.		Meters Sent by Consumers for Certification.	
Correct and Stamped.	Rejected.	Correct and Stamped.	Rejected.	Correct and Stamped.	Rejected.
7869 98·9 p.ct.	88 1·1 p.ct.	23,469 98·7 p.ct.	314 1·3 p.ct.	181 40·2 p.ct.	269 59·8 p.ct.

Maryborough Gas and Coke Company, Ltd.—In their report for the half-year ended June 30 last, the Directors recommend the payment of a dividend at the rate of 7 p.ct. per annum, leaving a balance to be carried forward of £406.

MERCHANDISE MARKS ACT INQUIRY.

Marking of Illuminating Glassware.

Under the Merchandise Marks Act, 1926, the Board of Trade Standing Committee has recently investigated applications from several quarters in respect of imported domestic, fancy, and illuminating glassware of all descriptions.

The applicants were:

(*a*) The British Flint Glass Manufacturers' Association; Messrs. James Powell & Sons (Whitefriars), Ltd.; the Stourbridge Glass Company, Ltd.; the New English Glass Manufacturers, Ltd.; the National Flint Glass Makers' Society; and the National Union of Glass Cutters and Decorators,

in the case of domestic, fancy, and illuminating blown glassware.

The applicants in each case were represented by Counsel, Mr. E. H. C. WETHERED.

The applicants were supported by Messrs. Hailwood & Ackroyd, Ltd., who were represented by Mr. E. A. Hailwood.

The opponents were:

(i.) The China and Glassware Section of the London Chamber of Commerce and groups of British manufacturers, supported by the Electrical Importers' and Traders' Association,

in regard to all the glassware dealt with in this report.

These parties were represented by Mr. N. L. C. MACASKIE and Mr. HORACE SAMUEL.

Domestic, fancy, and illuminating blown glassware and pressed glassware were dealt with first.

In regard to these categories of goods, the applicants stated that it was difficult for an expert in the trade, and impossible for the ultimate purchaser, to distinguish between glassware made here and that made abroad. They said that it is not the general practice in the retail shops and showrooms to keep British and foreign glass separate, and that the retailer himself frequently cannot tell the difference. They added that British place names are used in connection with catalogues or advertisements of imported glassware, and that this tends to increase the risk of confusion referred to above.

The applicants asked that imported glassware of these descriptions should be required to bear an indelible mark of origin, and that the mark should be applied by one of the following methods: Acid etching or stamping, engraving, sand blasting, moulding, or by means of burnt-on enamel. They claimed that all glass, except small pieces, such as beads, could be marked by one of these methods without injury, and they produced numerous exhibits, both of expensive and cheap glassware, marked by one or other of these methods with the maker's name or trade mark. They brought evidence to show that it is the practice of some British firms to apply their name by acid etching or stamping or other means to some or all of the glass which they make, and that certain foreign manufacturers mark their glassware permanently with their name. They maintained that the cost of marking by these methods was negligible.

They considered that a mark on a label attached to the goods would be unsatisfactory, and they brought evidence to the effect that in the heated retail shops and showrooms a label is liable to come off. They therefore considered that a permanent mark was necessary for the protection not only of the ultimate buyer but of the retailer.

They asked for an Importation Order as well as a Sale Order. In support of their request for an Importation Order they said that the method of marking which they desired could most conveniently be applied to the goods in the maker's factory, and that the risk of breakage would be less if the marking were done there. They added that an Importation Order would be more effective than a Sale Order alone, owing principally to the difficulty of distinguishing between foreign and British glassware referred to above.

The opponents claimed that the bulk of imported glassware consists of cheap blown glass which is sold at much lower prices than the English products, and can be easily distinguished from British ware by its lower price. They considered that such goods are of a different character from those made in this country and do not compete with them. They maintained, therefore, that no Order-in-Council is necessary.

In opposition to the application for an Importation Order the opponents urged that great difficulties and delays would be met with at the Customs, and they added that the breakages which would result from the Customs inspection would be a serious matter.

In regard to the request for an indelible mark, they maintained that the marks on British glass which had been put before them were not "conspicuous," and that similar marks applied to imported goods would not satisfy the requirements of the Act. On the other hand, if the mark were made conspicuous, they considered that the goods would be disfigured and rendered unsaleable. They objected to a permanent mark on illuminating glassware on the ground that such a mark would be thrown into sharp relief by the light within it and would be a permanent blemish. They added that in many cases such glassware is fitted in Great Britain to a fixture of metal or other material made in this country, and that in such cases a conspicuous mark of origin on the glass would lead the purchaser to believe that the whole fitting is made abroad, although the glass part is generally responsible for a small proportion of the total cost.

They added that the cost of marking would be a serious matter in the case of cheap glassware, and that a permanent mark of the kind asked for would result in interference with the re-export trade.

In the course of the inquiry, Counsel for the opponents said that their clients did not object to a Sale Order and a label mark, if the Committee thought that a case had been made out for marking.

Subject to the exceptions mentioned in the Annex, we consider that the applicants have made out a case for an Order for the marking of these categories of imported glassware. There is, in our view, no question as to the general similarity of British and foreign glassware, and we do not accept the contention of the opponents that the difference in price always affords a sufficient indication to the ordinary purchaser of the origin of the goods.

We do not, however, consider that a sufficient case has been made out for an Importation Order, as we see no reason why a Sale Order should not be as capable of effective enforcement as in the case of many other articles to which such Orders are already applicable.

As regards the form of the mark, some of the exhibits, both of fine glass and cheap glass, put before us bore etched or other marks which, in our opinion, were conspicuous and yet did not disguise the goods.

Having regard to these considerations, we do not think it possible to require in all cases an indelible mark on the glass, and we have, therefore, been compelled to consider the possibility of permitting the option of a label.

The evidence in regard to the effectiveness of labels and their liability to fall off was very conflicting. The labelling of glass, however, is admittedly common in the trade. The applicants themselves sometimes label their goods with their name or trade mark, and according to the evidence the price of glassware is usually indicated by labels adhesively applied to the glass. We have consulted the Government Chemist as regards this matter, and our conclusion is that if suitable adhesive materials (such as gum arabic, dextrine, &c.) are used in sufficient quantities and the label is applied with reasonable care, there is no sufficient reason why a label should not satisfactorily serve the purpose of informing the purchaser of the origin of the glass.

As we are not recommending that an Importation Order should be made or that an indelible mark should be insisted upon, we see no reason for specifically exempting glass for mounting from the Order. We consider, however, that it should be provided that in the case of a mounted article which consists of imported glassware united with metal, wood, or other materials, the glassware should not be required to bear an indication of origin when its value is only an unimportant part of the value of the composite article.

The opponents appeared to deal with illuminating glassware as if it were "glassware for mounting." We do not agree with this view. According to the evidence, the bulk of illuminating glassware is sold separately from the fitting, and even when fitted, the glassware is generally "united" with the fitting. We do not, therefore, intend the above exemption to apply to illuminating glassware, which we consider should be marked in accordance with our recommendations in the Annex to this Report.

ANNEX.

RECOMMENDATIONS AS TO MARKING.

The following classes and descriptions of imported glassware shall bear an indication of origin at the time of sale or exposure for sale, both wholesale and retail, in the United Kingdom—namely, domestic, fancy, and illuminating blown glassware of all descriptions, other than electric lamp bulbs.

The indication of origin shall be applied to each article by moulding, acid-stamping or etching, sand-blasting, engraving or burnt-on enamel, or by means of a label securely affixed by adhesive means.

Provided that the lid or cover of a pot, bowl, or dish need not be separately marked if the pot, bowl, or dish with which it is sold or exposed for sale bears an indication of origin.

SMOKELESS FUEL IN THE HOME FIRE.

Medical Officer Points the Way to More Sunshine.

"It is desirable that the Government and local authorities should not only encourage the wide adoption of existing smokeless fuels, such as gas and electricity, but should also, by educational methods, endeavour to secure the general use of smokeless fuels, such as those derived from low-temperature carbonization."

Dr. C. W. Hutt, Medical Officer of Health for Holborn, from whose annual report, just published, the above extract is quoted, points out that the Public Health (Smoke Abatement) Act, 1926, though an advance on previous legislation for dealing with the smoke nuisance, is by itself inadequate to deal with the serious consequences to public health of atmospheric pollution, inasmuch as it deals solely with the emission of industrial smoke, whereas it is often the domestic fire which causes the trouble. In London, on an average, 37,000 tons of coal are burnt daily in domestic fires, contributing largely to the pall of smoke over the Metropolis.

"Atmospheric impurities," he continues, "are undoubtedly responsible in a wide measure for pulmonary diseases, and, indirectly, by reducing sunshine, for diseases peculiar to childhood, notably rickets, as well as for a general lowering of the vitality. This deplorable state of affairs cannot be remedied until practical steps on a large scale are taken to deal with the all-important problem of domestic smoke.

"The general use of smokeless fuel in the home fires, as well as in industrial furnaces," concludes Dr. Hutt, "would prove a valuable and effective measure of lessening smoke and fog in town atmospheres."

MORPETH GAS COMPANY.

Steady Expansion of Business.

The past year has been one of progress for Morpeth Gas Company. There has been a gratifying expansion of business, and the Directors' report showed that the Company were getting a full share of the new business resulting from the Council's progressive housing schemes and the natural growth of the town.

The Annual Meeting of the shareholders was held at the office on Aug. 20, Mr. RALPH CRAWFORD, Chairman, presiding.

FINANCIAL RESULTS.

The CHAIRMAN, in moving the adoption of the annual report, said that their gross profits for the year had been £3045, an increase of £400 over last year. It was not a record in the history of the Company, because in one year they had made £300 more profit, but with that exception this year's was the largest gross profit they had had. That profit had been due to the fact that they had had during the year excellent coal, which exactly suited their purpose, and at a very satisfactory price.

They proposed that the gross profits be dealt with in the following way. In writing off depreciation on meters and cookers, £300. That was more than they had been accustomed to write off—in fact double that of last year. They were doing that because last year they had purchased an exceptionally large number of new meters and cookers, owing to the expansion of their business. They felt they had a good balance in hand, and took the opportunity of writing off more than the usual sum for depreciation. The position in regard to meters and cookers was singularly favourable. They stood in their books at £1564. Now during the last three years they had spent £953 for new meters and £747 for new cookers—a total of £1700. In addition to that they had spent £650 in reconditioning cookers, which really meant they had something like £2350 worth of stock, which stood in their books at £1564.

Then they proposed to place on reserve for special renewals of plant £350. That stood in their books at £4644. There was no likelihood that they would be called upon to meet any new expenditure for renewals of plant this year.

They next proposed to pay the usual dividend of 6 p.ct. on preference shares and 7 p.ct., free of tax, on ordinary shares. He thought that was a very satisfactory dividend indeed. The balance of £1562 they proposed to carry to reserve. That was again undivided profit account, and it was equal to slightly over 5 p.ct. on their whole capital.

ABOLITION OF METER RENTS.

The Chairman went on to say that as a Board of Directors they had decided to abolish meter rents. He did not think there had been any abolished in the North of England yet, but he would be pleased to think that the Morpeth Gas Company was the first to do so. With regard to consumers with slot meters they proposed to give this special rebate on their gas bill, which would be equal to the benefit which would accrue to the ordinary consumer by the abolition of the meter rent. He added that those who used less than 1000 c.ft. of gas in a quarter would continue to pay meter rent. In such cases they only use it as stand-by.

Mr. R. JACKSON seconded the adoption of the report.

SATISFACTORY PROGRESS AT DUNDEE.

Mr. James Dickson's Annual Report.

The annual report of the Engineer and Manager of the Dundee Gas Department (Mr. James Dickson) for the year ended May 15 shows that the gas made amounted to 1,858,706,250 c.ft. of coal and carburetted water gas, compared with 1,808,490,690 c.ft. in 1927-1928, an increase of 50,215,560 c.ft. The gas sold, inclusive of that used on works, amounted to 1,696,366,300 c.ft., compared with 1,655,549,245 c.ft., an increase of 40,817,055 c.ft. Gas unaccounted for amounted to 8·70 p.ct. of the production, compared with 8·45 p.ct. during the previous year. The increase in gas consumption, alongside keen competition with electricity, provides evidence that these forms of energy continue to develop in their own particular spheres of utility.

The lower yield of gas per ton of coal—*i.e.*, 15,928 c.ft., compared with 16,147 c.ft.—was due to the necessity for keeping horizontal retorts in use for a much longer winter period than is ordinarily the case. At the commencement of the season weather conditions were mild, but thereafter developed into extreme cold, culminating in the great frost towards the end of February and early March. The older form of retorting plant reduced the average yield of gas obtained per ton, and likewise detrimentally affected coke production through a surplus number of retorts having to be kept under fire for at least a month longer than usual. Tar yields were affected to a somewhat similar extent due to the decreased yield obtainable from the horizontal, compared with the vertical retorts.

Properties to the number of 286 embracing 2804 consumers have been dealt with under the powers conferred through section 74 of the Dundee Corporation Order Confirmation Act, 1927, and there is abundant evidence available as to the great benefits thereby brought to consumers whose lighting and heating arrangements were previously totally inefficient.

The expenditure on extensions to plant at the Dundee works, tar distillation plant, mains, meters, stoves, and fires amounted to £39,362. The purchase of, and improvements to, Britannia Works cost £18,044; compressor house and two 200,000-c.ft. compressors and connections £6678; sulphate of ammonia neutralizing plant £1253; and the balance was expended on minor additions to manufacturing plant. Tar distillation works capital expenditure amounted to £1803, while extensions to mains, services, meters, stoves, and fires cost £8842. In order to increase the reserve of gas storage and equalize distributing pressures, work was commenced on the erection of a one million gasholder at Perrie Street, Lochee. Through the operation of the sinking fund, £34,200 of old debt was repaid, and the net increase on outstanding debt by reason of the foregoing expenditure was £5071. The outstanding loan debt on the undertaking at May 15 amounted to £438,261, equal to £236 per million c.ft. of gas, compared with £433,189, or £239 per million c.ft. produced during the year 1927-1928.

WORKING RESULTS.

The cost of manufacture of gas amounted to 2s. 0·672d., compared with 2s. 0·026d. per 1000 c.ft. of gas accounted for, due largely to the increased carbonizing charges arising from the use of horizontal retort plant. Distribution of gas cost 6·571d., compared with 7·676d. per 1000 c.ft. for the year previous. Rates and taxes amounted to 2·477d., against 3·322d., and administration charges were 2·829d., against 2·776d. The gross cost of gas manufactured for the year 1928-1929 was 3s. 0·549d., compared with 3s. 1·800d. for the previous year. After reduction of returns from residual products amounting to 8·510d. for the year under review, compared with 1s. 0·821d. in 1927-1928, the net costs of gas were 2s. 4·039d. and 2s. 0·979d. respectively. The drop in receipts from residual products was largely attributable to the condition of the tar market.

The gas revenue derived per 1000 c.ft. amounted to 2s. 10·887d., compared with 3s. 2·836d., on account of the reduction of 4d. per 1000 c.ft. which came into operation at the beginning of the financial year. The balance carried to net revenue was 6·848d., compared with 1s. 1·857d. for the year previous.

THE INCREASE IN PRICE.

It is a matter for regret that at a time when a deficit of £70,606, incurred through the coal stoppage of 1921, had been reduced at the end of 1928 to a figure of £8604, despite the six months' coal stoppage of 1926, and the price of gas likewise reduced from 3s. 9d. to 3s. per 1000 c.ft., it should have become necessary to increase this by 5d., largely on account of the conditions ruling in residual products markets. This matter is not merely a local or national question but one of international dimensions, and meantime gives those responsible for the conduct of gas undertakings very great concern. Abnormal fluctuations in the prices of the tar products of the industry will, it is hoped, be prevented, to a large extent, by a closer combination of the various interests involved, and much depends upon the efforts presently being put forward to stabilize markets in this direction.

In order to reduce the use of horizontal retorts, additional carburetted water gas plant of a capacity of 1·37 millions per day of blue gas is under erection for completion by Oct. 31.

STREET LIGHTING IN NORWICH.

A Century of Progress.

The following article from the "Eastern Evening News" (Norwich) gives an interesting story of the progress of street lighting in Norwich from the earliest days when oil was the only illuminant.

IN VERY EARLY DAYS.

In the early days of last century what a dark and dismal place old Norwich must have been, with its flickering oil lamps, which only "made darkness visible." At that time the City Paving Commissioners were advertising for tenders for lighting the lamps. The contractor, it was announced, was to receive from the Commissioners "such lamps and lanterns" as were required to be lighted, repair the lamp irons if necessary, and fix the same up in the streets. It was also stated in the advertisement that "the number of lamps will be about 900, and the contractor is to light the same seven 'darks'—21 nights in the first dark, 22 nights in the third and fourth darks, and 24 nights in the other four darks, and an additional seven nights after the seventh dark. To commence on Sept. 16, with proper burners, good oil, and wicks of sufficient size and quality." Our forefathers were evidently "men of frugal minds" in lighting affairs.

The "darks" were, of course, the seven months in the year when there was the least daylight. Then it was made plain in the advertisement that "the said lamps are to be kept burning every night of lighting from sunset until five o'clock in the morning in the months of November, December, January, and February, and until three o'clock in the morning in the other months." The contractor was also duly warned that he would forfeit 4d. for each lamp he omitted to light; and he was to take down and deliver up all the lamps at the end of the "darks" in as good a state as he received them.

HOW THE GAS WAS TURNED ON.

So matters went on in those gloomy years, only relieved by a gas gleam in December, 1814, when a gas light was a Christmas attraction at a shop in the Market Place. In that case it seems to have been a freakish enterprise, as we are told that the gas was conveyed from a small fireplace in a kitchen, through tubes, and "16 brilliant lights were burning five hours at the trifling expense of 9d. in coals."

It was not until 1819 that a Company was formed for lighting the city with oil-gas, the works being situated in St. Stephen's Back Street. It seems that the frequent shop robberies were strong arguments for some improved system of lighting. And then in January of the following year the first iron gas pipes were laid in the Market Place; and in May the street lamps, and burners in several shops, were lighted by oil-gas for the first time. The venture was described as fairly successful, the new illuminant giving "a strong and steady

light in the Market as far as it extended," while it was stated that the effect of three burners was really "brilliant."

But the all-conquering coal gas was soon knocking at the door, and by 1825 the British Gaslight Company had stepped in and purchased the local company's works. It was then that the great gas light era really dawned in the city—when the site for the British Gaslight Company's premises was bought in World's End Lane, near St. Martin-at-Palace, when extended powers were obtained for supplying the city and suburbs with purified coal gas, and when the great works at Bishop's Bridge were completed in 1830. Thus began a long chapter of steady expansion and enterprise, with additional up-to-date buildings, and the rapid extension of mains and service pipes, which has been maintained for over a century. And then those other boons of later years, the gas stoves and geysers and gas cookers, followed by thousands in their train.

A WARM WELCOME.

Looking back to the early days of gas lighting in Norwich, there appears to have been no exuberant outburst of public feeling when the new light dawned in 1825—not even when the Company decided in 1836 to reduce the price to consumers by meter from 13s. per 1000 c.ft. to 10s.! But, in later years, when the gas light brightened up some of the Norfolk towns, there were very festive celebrations; for at North Walsham, in 1838, a band of music joyfully welcomed the advent of the gas jet, while Aylsham hailed it with the ringing of the church bells, the distribution of beer, with fireworks and a dinner and ball. In these cases, the coming of the gas not only lightened the darkness of the country towns, but made the people positively light-hearted as they welcomed its beams—little dreaming of the wonders of light and power which were yet to come.

CORK GAS COMPANY.

Satisfactory Progress.

The 121st ordinary general meeting of the shareholders of the Cork Gas Consumers' Company was held at the offices, South Mall, on Aug. 30. Mr. WM. B. HARRINGTON (Chairman) presided.

The report and statement of accounts, submitted by the Secretary (Mr. Richard Healy) showed a very satisfactory increase in receipts from sales of gas, when compared with the corresponding half-year in 1928. The balance of profit and loss was £7455, with which the Directors recommended the payment of the ordinary dividend at the rate of 8 p.ct. per annum, and a supplementary payment of 2s. per share on account of arrears of previous dividends, which were paid at reduced rates.

The CHAIRMAN, in moving the adoption of the report, said: The results of the past half-year's business are exceedingly satisfactory, the consumption of gas showing an increase of nearly 5¾ p.ct. over the corresponding period of last year, due chiefly to the steady increase in the use of gas appliances for both domestic and industrial purposes. On the other hand, there has been some falling off in the receipts from residuals. That the demand for gas cooking and heating appliances shows no signs of diminishing is proved by the fact that during the half-year we fixed 487 stoves of various descriptions, and there was a net increase of 144 in the total number of meters fixed. You will be interested to hear that our sale of gas now is much more than what it was 31 years ago—just before electric light was first publicly supplied in Cork—the actual increase being 57·4 p.ct., and more than half of this increase has been gained in the last ten years of the period. In order to cope with this ever-growing demand for gas, we were faced with the urgent necessity of increasing our storage plant, and as our largest gasholder (No. 4) was near the end of its life, we decided to erect an entirely new one of the spiral-guided type, with an increased capacity of about 50 p.ct., and the work is now very near completion.

On the motion of Mr. DOYLE, seconded by Mr. O'CONNELL, a dividend of 8 p.ct., with a supplementary payment of 2s. per share on the account of arrears in previous dividends, was declared.

AS SEEN BY OTHER EYES.

The British Gas Industry Viewed from Abroad.

The following (which indicates the interest taken abroad in the affairs of the British gas industry) is extracted from an article that appeared some time ago in "El Mercurio," one of the daily papers published to Valparaiso. For the translation of the article we are indebted to Mr. S. Lawrence Mugford, Works Engineer of the Valparaiso Gas Company.

The gas industry is a very notable example of the truth of the saying that "threatened industries live long." In England, this industry is of considerable age, and its origin dates from the time of the Napoleonic wars.

The British gas industry to-day occupies one of the first places among the great national industries, and shows a solidity always strengthening. Withal, when, at the end of last century, the inventor, Edison, lit the first carbon filament lamps, by passing an electric current through them, many people assumed that the gas industry was condemned to death. Without doubt, as frequently happens, the idea of one genius gave birth to another, and Welsbach, by means of his incandescent mantle, saved the situation for gas as an illuminant.

Notwithstanding, it is not this invention, though very important, which has made the gas industry prosperous. It is the realization of the value of all the chemical products contained in the tar, a bye-product which for some time was scarcely made use of.

During the whole of last year the gas industry of Great Britain continued to prosper; the proof of this being in the almost general rising of the shares of the gas companies. Certain financial periodicals make a calculation every year of the rise or fall of united shares, reverting to them in order to pick out certain representative shares. A short while ago, the Bankers' Magazine published such a list, and it is instructive to note that the shares of the gas companies included in the list show, for 1928, an average rise of 6 p.ct. This rise is the more notable when many of the companies find themselves subjected to strict limitation, established by law, by which they have to distribute their profits between their shareholders and their consumers.

If one looks for the cause of the progress of the gas companies during the past year, it will be seen that it is due principally to the diminution of costs. Many of the coal contracts, hurriedly made in the days of the great coal strike three years ago, expired in 1928. Apart from this, there was the general reduction of prices of coal, and also in the prices of the principal metals employed, with the exception of copper. Up to a certain point also, the rationalization of the industry has taken place, there having been various fusions.

The production of gas in the ordinary gas-works is carried out by means of the carbonization of coal at high temperature—a process as old as the industry itself. The companies have to make a commercially remunerative business of the new treatment of coal at low temperature, and this is now on the horizon. It seems, therefore, that the British gas industry is about to enter a new era. Two of the principal London gas companies are already experimenting in carbonization at low temperatures, and within one or two years they will have obtained very valuable data, indicating a definite course to follow.

It seems inevitable that the companies interested in the old and new treatments of coal are going to unite, which will result in a benefit to themselves and to the great coal mines for which Great Britain is famous.

GAS AND CONCRETE ROADS.

Drawing the attention of the local Borough Council to the fact that the widespread use of reinforced concrete as a material for road surfaces has brought in its train a very real danger that has already been the cause of much damage, the "Aldershot News" says:

It has always been a point of objection against this form of road material that where the four services of gas, water, electric current, and sewers are laid under the roadway, the use of reinforced concrete renders the necessary attention to these services very difficult and expensive. In addition, there is a danger from explosion arising from undetected leakage from the gas mains and pipes. In London and elsewhere cases of this kind have occurred with loss of life and enormous damage.

Where the danger lies is in the difficulty of an early detection of such gas leakages. In the ordinary methods of road making, gas escaping from fractures in underground mains or pipes soon finds its way up to, and through, the road surface, and is quickly detected, and the leak easily located, while the gas is dissipated into the air without danger. Concrete, however, forms an impenetrable blanket over the services, when these are laid in the roadways; and even a small leak of gas becomes a positive danger to life and property. Not being able to escape, the gas goes on accumulating under the ground, begins to travel long distances, and in due time, unless detected, the situation is ripe for a first-class disaster. Aldershot has already experienced such a situation, when a leak of gas in the Ash Road filled the sewer there with gas, which exploded and did much damage.

If the Council insist on adhering to their policy of reinforced concrete for all the roads in the borough, then they should take steps to have the underground services relaid under the pathways, which will enable them to be got at quickly and easily. It is the only safe method, now that the roads generally are being subjected to such heavy traffic. The road shocks and vibration are a source of continual damage to the mains and pipes laid below; and even when laid under the strictest supervision, and employing the greatest care, leaks are always possible from underground gas pipes, as the soil in which they are laid is unstable under the shock of road traffic, or the never-ceasing action of rain water percolating under the surface.

To take up and relay existing underground services would, of course, be an expensive procedure; but as it is the only safe method to adopt in concrete road making, it should be invariably carried out, and the cost calculated in the scheme.

Forty-ton Wagons for the L.M.S.R.—An order for thirty 40-ton side-discharging wagons has been placed with the Birmingham Railway Carriage and Wagon Company by the L.M.S. Railway. The wagons have been designed for the experimental conveyance of coal in bulk between certain collieries and the L.M.S. Railway's electric power station at Stonebridge Park, which supplies current for the Watford electrified lines. It will be possible to empty and clear a train of twelve of these wagons, which are completely self-discharging, in about thirty minutes.

Messrs. Brotherton and Company's Commemoration Day.—To mark the 51st anniversary of the foundation of Messrs. Brotherton & Co., Ltd., Lord Brotherton invited all his workpeople, staff, and pensioners to visit the Newcastle Exhibition on Saturday, Aug. 31. There were contingents from all Messrs. Brotherton & Co.'s works and offices, and many old pensioners, the party numbering about 1000. The proceedings were most successful. Lord Brotherton, who was enthusiastically received by the guests, much enjoyed meeting his employees, and expressed the hope of having some similar form of annual reunion each commemoration day.

CONTRACTS OPEN.

Cookers and Fires.

The Warrington Gas Committee invite applications from firms desirous of tendering for the above. [See advert. on p. 565.]

Fire-clay Goods.

The Warrington Gas Committee invite applications from firms wishing to tender for fire-clay goods. [See advert. on p. 565.]

Meters, Lighting Goods, Oxide, and General Stores, &c.

The Warrington Gas Committee invite applications from firms desirous of tendering for the above. [See advert. on p. 565.]

Pipes, &c.

The Warrington Gas Committee invite applications from firms wishing to tender for pipes, &c. [See advert. on p. 565.]

COAL TRADE REPORTS.

From Our Own Correspondents.

NORTH-EAST COAST.

While Northumberland steam coals have been well maintained, the prompt market in almost all kinds of Durhams has been considerably easier during the past week. This may be attributed largely to the tonnage position, suitable boats having continued remarkably scarce. This has even resulted in idle time at some of the collieries, and cheap cargoes have been offering to those who could put in prompt tonnage. The general position remains firm, and collieries are satisfied to regard the position as only temporary, and are maintaining their prices for all inquiries ahead.

Superior qualities of gas coals exceptionally remain firm, and Wear Specials are strongly quoted at 17s. 6d. f.o.b., with bests at 16s. 6d. to 17s. Seconds, however, are easier at 15s. 6d. Coking coals have been much easier on the week, and ample supplies have been obtainable at 15s. 6d. to 16s. Durham bunkers are quoted at 16s. 3d. to 16s. 6d. for best sorts for prompt shipment, with seconds at 15s. to 15s. 6d. Northumberland steams are maintained at 15s. 9d. to 16s. for best screened sorts.

Gas coke is quoted at 21s. 6d. to 22s. f.o.b. for shipment.

YORKSHIRE AND LANCASHIRE.

Export continues steady and buyers seem prepared to fix up more forward business, although quotations at the collieries hold strong. The call for bunker coal remains quiet, but prices are maintained. The domestic trade is not so brisk as last week. The demand for furnace coke continues strong on home account, leaving little to offer for export. There is an improvement in the demand for gas coal, but supplies are adequate. Industrial fuel is in better request, the quotations being: Washed trebles 18s., doubles 17s. 6d., singles 16s. 6d., and smalls 15s. 6d.

The following are the Humber bunker and export prices, f.o.b. usual shipping ports:

South Yorkshire.—Hards, Association, bunkers 18s. 6d. to 19s., export 18s.; screened gas coal, export 18s.; washed trebles, export 18s.; washed doubles, bunkers 18s. 9d., export 17s. 6d.; washed singles, export 16s. 6d.; washed smalls, bunkers 16s. 3d., export 15s. 6d.; rough slack, bunkers 13s. 6d. to 13s. 9d., export 12s. 6d. to 13s.

West Yorkshire.—Hartleys (f.o.b. Goole), bunkers 17s. 6d., export 17s. to 17s. 6d.; screened gas coal, export 18s. to 18s. 6d.; washed trebles, export 17s. 6d. to 18s., washed doubles, export 16s. 9d.; washed singles, export 16s.; washed smalls, bunkers 15s.3d., export 14s. 6d.; unwashed trebles, export 17s. to 17s. 6d.; unwashed doubles, export 15s. 6d.; rough slack, bunkers 13s. 6d., export 12s.; coking smalls, export 12s.

Derbyshire and Nottinghamshire.—Top hards, bunkers 18s. 9d. to 19s. 3d., export 17s. 6d. to 18s. 3d.; cobbles, bunkers 18s. 9d., export 17s. 6d.; washed trebles, export 18s.; washed doubles, export 17s. to 17s. 3d.; washed singles, export 16s. to 16s. 6d.; washed smalls, bunkers 16s., export 14s. 6d.; unwashed doubles, export 16s.; rough slack, bunkers 14s. 3d. to 14s. 9d., export 12s.

Yorkshire, Derbyshire, and Nottinghamshire.—Steam coal, bunkers 17s. to 18s., export 16s. 6d. to 17s.; gas coal, export 22s. to 23s.; furnace coke, export 22s. to 23s.; washed steam (Goole, West Yorks.), bunkers 17s. 9d.; (Hull, West Yorks.), bunkers 18s.; (Hull, South Yorks.), bunkers 18s., export 17s.

MIDLANDS.

The September advance on house coals is 1s. 8d. at most of the associated collieries in the Yorkshire, Derbyshire, and Nottinghamshire area. In Cannock Chase and Warwickshire, the advance varies from 1s. to 2s., according to the amounts taken off in the summer.

Market exigencies also have influenced the revision in some of the districts. Where, as in the case of many of the Cannock Chase collieries, it is sought to enforce advances on coal which, though ordered in August, was not delivered till September, merchants are resisting strongly. They say that such exactions may have been submitted to in the subordination of normal trading principles to the prosecution of the war, but they are intolerable now. The collieries reply that they gave fair warning, and that the buyers and not they were responsible for the congestion of order books which involved a heavy carry-over from August to September.

This month business in house coals is extremely quiet on account of the warm weather, and the fact that most of the stocks put in at summer prices are still intact.

Now that industrialists are settling down to the ordinary routine again, more attention is being given to the renewal of contracts. Trade lacks vigour, however. Prices are unchanged. Coke is scarce; some of the ovenmen holding off.

OVERSEAS OPPORTUNITIES.

[Extracted from the Board of Trade Journal.]

South Africa.

One 10-ton Electric-driven Overhead Travelling Crane.—H.M. Senior Trade Commissioner in South Africa reports that the South African Railways and Harbours are calling for tenders, to be presented in Johannesburg by Oct. 17, for the supply of one 10-ton electric-driven overhead travelling crane. (Tender No. 1533.) Firms desirous of offering British-built cranes can obtain further particulars of this call for tenders upon application to the Department of Overseas Trade, 35, Old Queen Street, London, S.W.1. (Ref. A.X. 8463.)

Belgium.

Electric Travelling Crane, Portal Type.—The Acting British Consul-General at Antwerp reports that the Antwerp Municipality is calling for tenders, to be presented in Belgium by Oct. 10, for the supply of 32 electric travelling cranes, portal type. (Cahir des Charge No. 800.) Firms desirous of offering British-built cranes can obtain further particulars of this call for tenders upon application to the Department of Overseas Trade, 35, Old Queen Street, London, S.W. 1. (Ref. A.X. 8447.)

TRADE NOTES.

James Keith & Blackman Co., Ltd.

From Messrs. James Keith & Blackman Co., Ltd., we have received pamphlets dealing with Blackman volume fans, the "K-B" patent gas-fired "Challenge" boiler, and an interesting folder on induced draft and flue dust arresting, which should be of particular interest to power station engineers and technical directors of works steam generating plants.

Schneider Trophy, 1929.

On Saturday, Sept. 7, the Solent was the scene of most notable achievements by British airmen in British machines. The Schneider Trophy was won by Flying Officer H. R. D. Waghorn with a Supermarine-Rolls-Royce S6 Seaplane at an average speed for the course of 328·63 M.P.H., and Flying Officer R. L. R. Atcherley, also with a Supermarine-Rolls-Royce S6 Seaplane, set up a world's record for the 100 kilometres closed circuit at a speed of 331·75 M.P.H. "B.T.H." magnetos were fitted to both machines, and again demonstrated their remarkable reliability under the most exacting conditions.

Conclusive Welding Tests.

We have received from Alloy Welding Processes, Ltd., of Ferry Lane Works, Forest Road, E.17, a copy of their latest bulletin (No. 61), entitled "Conclusive Welding Tests." The firm, being manufacturers of electrodes for all purposes, receive from time to time inquiries as to the uses of the various types which they manufacture. Therefore, it should be of interest to those users of electrodes, who not only are uncertain of their requirements, but who desire to know the advantages to be obtained by using "A.W.P." electrodes, to read the reports of the tests contained in the bulletin, which were carried out independently by various customers, outside firms, and public authorities. While in some cases better results may have been obtained at the manufacturers' own works, it is thought advisable to give figures of competitive tests owing to their impartiality.

Stacey Engineering Company.

On Aug. 31 negotiations were completed whereby the Stacey Engineering Company, a new Ohio Corporation operating as a Holding Company, took over the following manufacturing concerns: The Stacey Bros. Gas Construction Company, of Cincinnati, Ohio; the Connersville Blower Company, of Connersville, Indiana; and the Wilbraham-Green Blower Company, of Pottstown, Pennsylvania. All these concerns have for a long period of years been engaged in the construction of gasholders, blowers, and other apparatus used by gas companies and oil companies. In addition to these three Companies, the new concern has a substantial interest in other allied concerns. The Stacey Engineering Company is incorporated with an authorized capital of $2,500,000 of 6 p.ct. preferred stock, 150,000 shares of "A" stock, and 200,000 shares of "B" stock, none of which will be offered to the public at this time.

New Rectifier for Electrostatic Precipitation.

An interesting development of the trickle charger now extensively used in wireless has been its application to electrostatic precipitation foreseen by Messrs. Simon-Carves, Ltd., who, in conjunction with Messrs. Ferranti, Ltd., have experimented with the Westinghouse metal oxide disc rectifier, and have successfully built rectifiers of this type for output voltages of approximately 60,000. This rectifier has now been in operation for some time, and has given every satisfaction, leaving no doubt of its reliability. Its success is marked by the orders already received by Messrs. Simon-Carves, Ltd. The chief advantages are no moving parts, and consequently less maintenance; the current consumption is reduced considerably with exactly the same "clearing efficiency;" and full wave rectification is obtained with a smooth continuous high tension uni-directional current, the ripple being almost negligible. This method of rectifying alternating current is used on the electrical detarrers installed in the bye-product recovery plants at the Askern Works of Low Temperature Carbonisation,, Ltd., and at Synthetic Ammonia and Nitrates, Ltd., Billingham, and is of special interest to the gas industry. In addition, equipments have been constructed and are in use in connection with electrical deposition on sulphuric acid plants.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Sept.* 9.

The prices of tar products remain unchanged.

Pitch continues very firm at about 47s. 6d. per ton f.o.b.

Creosote for export is still 6¾d. per gallon f.o.b.

Pure toluole is 2s. 3d. per gallon; 95/160 solvent naphtha, about 1s. 5d.; and pure benzole, 1s. 11d.

Pyridine bases are 3s. 9d. to 4s. per gallon.

Tar Products in the Provinces.

Sept. 9.

Markets for tar products generally continue steady. Pitch is still very firm. Small sales are here and there reported to have been made at 45s., but the bulk of the manufacturers are quoting 47s. 6d. in any position; and at this price a fair amount of business has already been done. There are still inquiries for delivery over the second half of next year; but manufacturers are declining at present to consider them.

For creosote the market remains unchanged.

In crude carbolic, competition is still very keen, and 2s. 5d. has been paid both for prompt and for delivery to the end of the year.

Crystals carbolic are firm; 8¾d. has been paid to the end of the year, and 9¾d. for immediate delivery.

Pure naphthalene is steady, and business continues to pass at fair figures, considering the value of creosote.

Water-white products are unchanged; but the tone generally is good.

The average prices of gas-works products during the week were: Gas-works tar, 25s. to 30s. Pitch—East Coast, 47s. 6d. f.o.b. West Coast—(f.a.s.) Manchester, 42s. to 42s. 6d.; Liverpool, 45s. 6d. to 46s. 6d.; Clyde, 45s. 6d. to 46s. 6d. Toluole, naked, North, 1s. 7½d. to 1s. 8½d. Coal-tar crude naphtha, in bulk, North, 9d. to 10d. Solvent naphtha, naked, North, 1s. 3¾d. to 1s. 4½d. Heavy naphtha, North, 1s. to 1s. 0½d. Creosote, in bulk, North, liquid and salty, 3¼d. to 3¾d.; low gravity, 2d. to 2¼d.; Scotland, 3¼d. to 3½d. Heavy oils, in bulk, North, 5½d. to 6d. Carbolic acid, 60's, 2s. 4d. to 2s. 5d. prompt. Naphthalene, £13 to £15. Salts, £5 to £5 10s., bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality, unsaleable.

Benzole Prices.

The following are considered to be the market prices to-day:

	s. d.	s. d.	
Crude benzole . . .	0 10	to 0 11	per gallon at works
Motor ,, . . .	1 5	,, 1 6	,, ,, ,,
90 p.ct. ,, . . .	1 7	,, 1 8	,, ,, ,,
Pure ,, . . .	1 10	,, 1 11	,, ,, ,,

Coatbridge Gas Company.—The annual report of the Company, which is to be submitted to the shareholders on Sept. 17, states that the accounts and balance-sheet are satisfactory. The sales of gas for the twelve months amounted to 1,310,866 therms, being an increase of 54,522 therms, or 4·34 p.ct., compared with the previous year. The gas rate was reduced to 8d. per therm as from July 1, 1928. The Directors recommend payment of dividends at the authorized rates—viz., £14 5s. p.ct. per annum on the original stock, and £9 19s. 6d. p.ct. per annum on the four issues of £10 shares, all less income-tax. The Directors record their regret at the great loss sustained through the death of one of the Board, Mr. Campbell Denholm, whose son, Mr. Robert Denholm, was co-opted to fill the vacancy.

Increased Gas Sales at Shrewsbury.—The annual meeting of the Shrewsbury Gas Light Company took place on Monday of last week; Mr. H. J. Hearn (Chairman of the Directors) presiding. The annual report stated that the gross profits on the revenue account amounted to £10,341. After allowing for the interim dividend of 2½ p.ct. (less tax) paid in March last, and the interest on mortgages for the year, the balance of net profit available amounted to £13,190. The reserve fund now stood at £13,593, and the special purpose fund amounted to £9674. There had been an increase of over 8½ million c.ft. in the sale of gas during the year, but a further fall in receipts from residual products. The price of gas had been further reduced as from June 30 by 0·2d. per therm, equivalent to 1d. per 1000 c.ft. The number of cookers on hire at June 30 was 5224, together with 1946 fires. There were also 3445 ordinary and 5779 prepayment meters in use. The adoption of the report, together with the statement of accounts, was moved by the Chairman, who referred to the Company's activities during the past year. He said that the total gas sold represented an increase of 3 p.ct. over the previous year; the increased receipts from this source amounting to £543, notwithstanding a reduction in the price of gas. On the other hand, coal and gas oil, their chief raw materials, had cost £2242 less. If contracts were duly honoured, there should be no increase in this item next year. Alderman Adams, on behalf of the Directors, expressed appreciation of the services which Mr. Charles M. D. Belton (Engineer, Secretary, and Manager) and his staff had rendered not only during last year, but for many years past. Mr. Belton mentioned that during the past ten years the progress of the Company had been such that one could look upon it with a certain amount of pride, for their increase of gas sold amounted to over 41 p.ct.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Aug. 28.]

Nos. 25,191—25,862.

BOARDMAN, E. E.—"Gas burners." No. 25,788.

FORSTER, J. D.—"Coin-freed gas meters." No. 25,610.

GLOVER, W. T.—"Retort house gas governors." No. 25,687.

GUTEHOFFNUNGSHUTTE OBERHAUSEN AKT.-GES.—"Freeing gas liquor from tar." No. 25,695.

HANSFORD, J.—"Enriching gas." No. 25,842.

HARTUNG, C. A.—"Automatic gas testing apparatus." No. 25,449.

HARTUNG, C. A.—"Process for automatically testing gases." No. 25,450.

HUMPHREYS & GLASGOW, LTD.—"Apparatus for cooling coke." No. 25,722.

METERS, LTD.—See Glover, W. T. No. 25,687.

METROPOLITAN GAS METERS, LTD.—See Forster, J. D. No. 25,610.

RITCHIE, C.—"Gas burners." No. 25,211.

WILSON, D. L.—"Prepaid gas meters." No. 25,423.

Dividends Declared at Hastings.—The Hastings and St. Leonards Gas Company are paying interim dividends (*less* income-tax) for the half-year ended June 30, at the following rates: £7 p.ct. per annum on the 5 p.ct. converted stock, 5¼ p.ct. per annum on the 3½ p.ct. converted stock, and £6 8s. p.ct. per annum on the 5 p.ct. additional stock.

The Half-Year's Results at Cleveland.—The profit made by the Cleveland Gas Company during the half-year to June 30, 1929, has been £757, to which must be added the amount brought forward from last half-year of £3310, making the balance at the credit of the profit and loss account at June 30, 1929, £4067, which sum the Directors propose should be disposed of as follows: In paying a dividend at the rate of 3 p.ct. per annum (*less* income-tax) for the half-year, and placing £200 to the contingent fund (making it £8900), which will leave to be carried forward to next half-year's account the sum of £3269.

Successful Year at Taunton.—Another successful year was reported at the annual meeting of the Taunton Gas Light and Coke Company. Reference was made by the Chairman (Mr. R. Bruford) to the fact that the modern tendency towards smaller houses and labour-saving devices had led to a greater appreciation of the economy and convenience of gas. The increase of 3 p.ct. in gas sales, he said, was very satisfactory, bearing in mind the previous large increases and the fact that during the last ten years their output had practically doubled. The profit made had been sufficient to enable them to recommend the payment of the usual dividends and to carry slightly more forward than before.

An Interesting Competition at Leamington.—The competition held in connection with the Leamington Rotary Club's Charity Carnival, in which competitors had to estimate the number of cubic feet of gas made at the Leamington Priors Gas-Works during the year ended Aug. 16, closed at 6 a.m. on Sunday, Sept. 1, when the meter reading was taken. The final figures were 400,786,000 c.ft. Two competitors tied for the first prize, a saloon car, their names being: Mr. R. Hollick, of Hunningham, and Miss A. Theasby, Snitterfield, whose estimates were 400,789,000. The third prize was won by Mr. A. F. Taylor, of Kenilworth, with 400,791,000; fourth, Mr. A. Caunt, Leamington, 400,794,000; and fifth, Miss M. King, of Watford, Herts, with 400,777,000. The Committee are to decide later, in view of the tie, how the first and second prizes are to be awarded.

New Vessel to Carry Coal for Bournemouth Company.—The self-trimming collier, "William Cash," which was launched by Messrs. Hawthorn, Leslie, & Co., Ltd., Hebburn-on-Tyne, on Tuesday, Sept. 3, is the first of two vessels ordered from this firm by Messrs. Stephenson, Clarke, & Associated Companies, Ltd., of London. The vessel is 234 ft. in length, and will carry 1640 tons, and is intended to carry coals for the Bournemouth Gas Company. The vessel was christened by Mrs. Waugh, wife of Mr. W. Waugh, the local Director of the owners. Speaking after the launch, Mr. J. T. Batey, Managing Director of the builders, regretted the absence of Mr. William Cash, after whom the vessel was named, and who was, he added, a distinguished figure in the gas industry and connected with many companies. The vessel, he said, had required more naval architecture and scientific investigation on account of her special trade than many larger vessels. Her coal would be dropped into her in a few hours, and she could also be discharged in a very short time. Provided that coal was available, her arrivals and sailings would be almost as punctual as a railway train.

The Carnoustie Gas Committee reported to the Town Council having agreed to make no change in the price of gas, though reserving the right to raise the price later if and when it was considered necessary to do so. The price of gas is 4s. 4½d. per 1000 c.ft. for ordinary meters, and 4s. 9½d. for slot meters.

As a first reminder of the gas fire season the Newcastle-upon-Tyne and Gateshead Gas Company are distributing one hundred thousand copies of an attractive pamphlet setting out in detail the many advantages of the gas fire over the coal fire in reducing the daily drudgery of fire-making and grate cleaning. "If you could measure comfort," part of the folder reads, "not by inches, but by the amount of trouble entailed to enjoy a few hours of ease and warmth, then you would be amazed to find what a saving of time and toil a gas fire ensures."

STOCK AND SHARE LIST.

[For Stock-Market Report, see earlier pages.]

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf.Yr	Dividends. Last Hf. Yr.	NAME	Quotations. Sept. 6.	Rise or Fall on Week.	Transactions Lowest and Highest Prices.
£			%p.a	% p.a.				
171,978	Stk.	Aug. 15	5	5	Aldershot 5 p.c. max. C.	†0—75	..	..
412,992	,,	,,	4	4	Do. 4 p.c. Pref.	73—76	..	..
1,551,868	,,	Apl. 11	7½	7½	Alliance & Dublin Ord.	96—99	..	96½—97½
374,000	,,	July 11	4	4	Do. 4 p.c. Deb.	62—65	..	..
533,655	,,	Aug. 29	7	7	Barnet Ord. 7 p.c.	112—115*	..	112½—113½
300,000	1	May 9	1/4⅛	1/4⅛	Bombay, Ltd.	18/6—20/6	..	18/6
172,500	10	Aug. 29	8½	9	Bournemouth 5 p.c.	122—134*	..	..
800,050	10	,,	7	7	Do. B 7 p.c.	122—124*	+ ½	124½—125½
439,160	10	,,	6	6	Do. Pref. 6 p.c.	10½—11*	..	10½
50,000	Stk.	July 11	3	3	Do. 3 p.c. Deb.	54—57	..	..
162,025	,,	,,	4	4	Do. 4 p.c. Deb.	72—75	..	..
857,900	,,	Aug. 29	7½	7½	Brighton & Hove 5 p.c. Con.	113—116*	..	113½—116
371,880	,,	,,	6½	6½	Do. 5 p.c. Con.	100—103*	..	101½—102½
1,367,500	,,	July 25	5	5	Bristol 5 p.c. max.	88½—91a	..	..
885,000	,,	Apl. 11	8	7½	British Ord.	117—120	..	..
160,000	,,	June 27	7	7	Do. 7 p.c. Pref.	112—117	..	..
180,000	,,	,,	4	4	Do. 4 p.c. Red. Deb.	71—74	..	..
450,000	,,	,,	5	5	Do. 5 p.c. Red. Deb.	94—97	..	96½
100,000	10	May 30	0	0	Cape Town, Ltd.	9—10	..	10—10 1/16
100,000	10	Apl. 24	4½	4½	Do. 4½ p.c. Pref.	6½—7½	..	..
150,000	Stk.	June 27	4½	4½	Do. 4½ p.c. Deb.	71—76	..	..
636,860	,,	July 25	6	6	Cardiff Con. Ord.	98—101	..	..
357,840	,,	June 27	7½	7½	Do. 7½ p.c. Red. Deb.	99—102	..	..
187,150	,,	Aug. 15	6½	5	Chester 5 p.c. Ord.	86—91b	..	..
98,936	1	May 9	†2/-	†2/-	Colombo Ltd. Ord.	35/—37/-	..	..
24,495	1	,,	1/4⅛	1/4⅛	Do. 7 p.c. Pref.	20/—22/-	..	..
575,402	1	Apl. 11	1/9⅛	1/9⅛	Colonial Gas Assn. Ld. Ord.	24/6—26/6	..	..
187,848	1	,,	1/7½	1/7½	Do. 8 p.c. Pref.	20/6—22/6	..	..
2,078,280	Stk.	July 25	7	5	Commercial Ord.	93—96	..	94½—95
476,000	,,	June 13	8	8	Do. 8 p.c. Deb.	56—59	..	..
787,560	,,	Aug. 15	7	7	Croydon sliding scale	108—111	..	109
468,100	,,	,,	5	5	Do. max. div.	81—84	..	..
542,270	,,	Aug. 29	10	7	Derby Con.	118—121e*	..	..
66,000	,,	June 27	4	4	Do. Deb.	68—71e	..	..
989,000	,,	Aug. 29	5	5	East Hull Ord. 5 p.c.	73—75*	..	..
1,009,180	10	Mar. 21	†4	†7	European, Ltd.	16½—18½	+1½	16½—17⅞
18,708,480	Stk.	July 25	5⅞	5⅞	Gas Light & Coke 4 p.c. Ord.	18/—18/6f	—/1½	18/—18/6
3,660,000	,,	,,	3½	3½	Do. 3½ p.c. max.	61—63	..	61¼—61⅞
4,187,020	,,	,,	4	4	Do. 4 p.c. Con. Pref.	73—75	..	73½—74½
5,602,620	,,	June 13	3	3	Do. 3 p.c. Con. Deb.	56½—59½	..	57½—57½
3,643,770	,,	,,	5	5	Do. 5 p.c. Red. Deb.	97—100	..	93½—99½
82,500	,,	Aug. 29	7	7	Hastings & St L. 5 p.c. Conv	98—103*	..	..
388,740	,,	,,	5½	5½	Do. 3½ p.c. Conv.	77—82*	..	..
70,000	10	Apl. 24	†10	†10	Hongkong & China, Ltd.	14—15	..	..
218,100	Stk.	Aug. 29	6	6½	Hornsey Con. 3½ p.c.	84—87*	..	..
1,976,000	,,	May 30	10	20	Imperial Continental Cap.	425—445	+20	420—448
328,180	,,	Aug. 15	3½	3½	Do. 3½ p.c. Red. Deb.	69—72	..	70
286,242	,,	Aug. 15	7½	8	Lea Bridge 5 p.c. Ord.	115—118	..	..
3,145,907	,,	Aug. 15	6½	6	Liverpool 5 p.c. Ord.	93—94b	..	..
600,000	,,	Mar. 21	7	7	Do. 7 p.c. Red. Pref.	102—104b	..	..
168,786	,,	Aug. 29	8	9	Maidstone 5 p.c. Cap.	122—127*	..	..
63,480	,,	June 27	3	3	Do. 3 p.c. Deb.	53—56	..	..
75,000	5	June 13	†8	†10	Malta & Mediterranean	5½—6	..	..
322,000	—	Apl. 2	—	5½	Metrop'l'n (of Melbourne) 5½ p.c. Red. Deb.	100—102	..	..
841,920	Stk.	May 30	†5	†9	Montevideo, Ltd.	105—108	..	..
2,051,316	,,	July 25	5⅞	5	Newcastle & Gateshead Con.	16/9—17/3d	..	..
662,856	,,	,,	4	4	Do. 4 p.c. Pref.	70½—71½d	..	..
691,705	,,	June 27	8½	8½	Do. 8½ p.c. Deb.	68—69d	..	..
181,780	,,	Aug. 29	7/1/0	7½	North Middlesex 8 p.c. Con.	110—115*	+5	..
800,000	,,	Apl. 24	9	7	Oriental, Ltd.	115—120	..	..
205,162	,,	June 27	8	8	Plym'th & Stonehouse 5 p.c.	110—113	..	..
424,416	,,	Aug. 29	8½	8	Portsm'th Con. Stk. 4p.c. Std.	113—118*	..	..
241,446	,,	,,	5	5	Do. 5 p.c. max.	80—88*	..	..
2,334,464	1	June 27	—	15	Primitiva Ord.	35/—37/-	..	35/6—36/-
244,500	100	June 8	4	4	Do. 4 p.c. Red. Deb.	92—95	..	..
595,000	Stk.	July 25	4	4	Do. 4 p.c. Red. Deb. 1911	79—82	..	..
416,845	,,	June 27	4	4	Do. 4 p.c. Cons. Deb.	79—82	..	..
150,000	10	Mar. 21	6	6	San Paulo 6 p.c. Pref.	8½—9	..	..
1,736,968	Stk.	Mar. 21	6½	6½	Sheffield Cons.	108—110e	..	..
95,000	,,	Jan. 10	4	4	Do. 4 p.c. Deb.	74—77e	..	..
90,000	10	June 13	†4	†4	South African	4—6	..	..
5,609,895	Stk.	July 26	7½	5	South Met. Ord.	101—103	..	100⅞—102½
500,000	,,	,,	6	6	Do. 6 p.c. Irred. Pf.	106—107	..	106½
1,895,445	,,	July 11	3	3	Do. 3 p.c. Deb.	57—60	..	58
784,000	,,	Mar. 7	6½	6½	Do. 6½ p.c. Red. Db.	100—102	..	..
91,500	,,	Aug. 15	8½	8½	South Shields Con.	103—104d	..	..
1,543,795	,,	July 25	6½	6½	South Suburban Ord. 5 p.c.	103—106	..	104
468,837	,,	June 27	5	5	Do. 5 p.c. Deb.	95—98	..	95
647,740	,,	Aug. 15	5	5	South'mpton Ord. 5 p.c. max.	76—79	+1	76½—77½
121,275	,,	June 27	4	4	Do. 4 p.c. Deb.	70—73	..	..
179,014	,,	July 25	8	8	Sutton Ord.	115—118	..	..
67,823	,,	June 27	—	5	Do. 5 p.c. Deb.	89—92	..	..
350,000	,,	Feb. 21	7	7	Swansea 7 p.c. Red. Pref.	100—102*	..	100½
200,000	,,	June 27	6½	6½	Do. 6½ p.c. Red. Deb.	100—102	..	..
1,002,275	,,	Aug. 15	6⅝	6⅝	Tottenham District Ord.	105—108	..	106
150,000	,,	,,	5½	5½	Do. 5½ p.c. Pref.	97—100	..	..
181,255	,,	June 13	4	4	Do. 4 p.c. Deb.	74—77	..	..
389,094	,,	Aug. 29	7	7	Uxbridge, Maidenhead, & Wycombe 5 p.c.	93—98*	..	..
98,880	,,	,,	5	5	Do. 5 p.c. pref.	85—90*	..	..
80,000	,,	July 11	9	9	Wandsworth, Wimbledon, and Epsom— Wandsworth A 5 p.c.	144—147	..	..
355,626	,,	,,	7½	7½	Do. B 5½ p.c.	122—127	..	..
452,583	,,	,,	6.5	6.5	Do. C and New	100—105	..	..
352,000	,,	,,	7½	7½	Do. Wimbledon 5 p.c.	112—117	..	..
98,000	,,	,,	7½	7½	Do. Epsom 5 p.c.	123—128	..	..
300,000	,,	,,	5	5	Do. 5 p.c. Pref.	87—92	..	..
88,418	,,	June 27	3	3	Do. 3 p.c. Deb.	54—57	..	..
384,743	,,	,,	4	4	Do. 4 p.c. Deb.	74—77	..	..
397,560	,,	,,	5	5	Do. 5 p.c. Deb.	93—96	..	..

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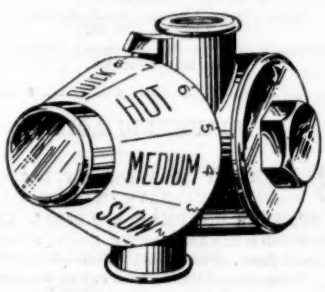

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